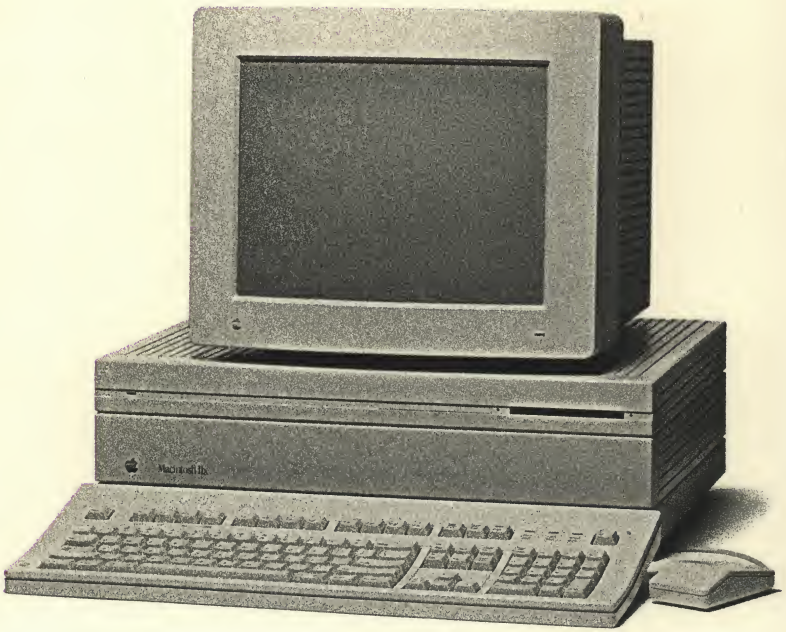
# Macintosh® IIx
# Owner's Guide



## Limited Warranty on Media and Replacement

If you discover physical defects in the manuals distributed with an Apple product or in the media on which a software product is distributed, Apple will replace the media or manuals at no charge to you, provided you return the item to be replaced with proof of purchase to Apple or an authorized Apple dealer during the 12 month period after you purchased the software. In addition, Apple will replace damaged software media and manuals for as long as the software product is included in Apple's Media Exchange Program. While not an upgrade or update method, this program offers additional protection for up to two years or more from the date of your original purchase. See your authorized Apple dealer for program coverage and details. In some countries the replacement period may be different; check with your authorized Apple dealer.

**ALL IMPLIED WARRANTIES ON THE MEDIA AND MANUALS, INCLUDING IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED IN DURATION TO 12 MONTHS FROM THE DATE OF THE ORIGINAL RETAIL PURCHASE OF THIS PRODUCT.**

Even though Apple has tested the software and reviewed the documentation, **APPLE MAKES NO WARRANTY OR REPRESENTATION, EITHER EXPRESS OR IMPLIED, WITH RESPECT TO SOFTWARE, ITS QUALITY, PERFORMANCE, MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE. AS A RESULT, THIS SOFTWARE IS SOLD "AS IS," AND YOU THE PURCHASER ARE ASSUMING THE ENTIRE RISK AS TO ITS QUALITY AND PERFORMANCE.**

**IN NO EVENT WILL APPLE BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES RESULTING FROM ANY DEFECT IN THE SOFTWARE OR ITS DOCUMENTATION,** even if advised of the possibility of such damages. In particular, Apple shall have no liability for any programs or data stored in or used with Apple products, including the costs of recovering such programs or data.

**THE WARRANTY AND REMEDIES SET FORTH ABOVE ARE EXCLUSIVE AND IN LIEU OF ALL OTHERS, ORAL OR WRITTEN, EXPRESS OR IMPLIED.** No Apple dealer, agent, or employee is authorized to make any modification, extension, or addition to this warranty.

Some states do not allow the exclusion or limitation of implied warranties or liability for incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

## Warning

This equipment has been certified to comply with the limits for a Class B computing device pursuant to Subpart J of Part 15 of FCC rules. Only peripheral devices (computer input/output devices, terminals, printers, and so on) certified to comply with Class B limits may be attached to this computer.

Operation with noncertified peripheral devices is likely to result in interference to radio and television reception.

# Contents

Radio and television interference vii

**Welcome to the Macintosh IIx ix**

About this manual x
About the other manuals xi
Using the manuals xii
For the beginner xii
For the experienced user xiii
For the advanced user xiii
Apple user groups xiv

**1 Getting Started 1**

Unpacking 2
Taking a closer look 3
Basic ergonomics 5
Putting it all together 6
The power cord 6
The monitor 8
The video card 8
The video cable 15
The monitor's power cord 16

The mouse and the keyboard 17
Ready to go? 20
Other devices 21
Internal hard disk 22
Important safety instructions 22
Starting up the computer 23
Training disk or tutorial? 24
The training disk 25
Problems starting up? 27
Stopping 27

**2 Inside the Macintosh IIx 31**

The microprocessor 32
Coprocessors 35
RAM 38
Paged memory management 39
ROM 39
Video displays 40
Disk drives and disks 42
The mouse and the keyboard 47
The mouse 47
The keyboard 48

**3 How the Macintosh IIx Works 51**

System software 52
The System file 53
The Finder 54
Resources 55
Startup disks 56
Scanning order 56
Current startup disk 56
How it works 57
Starting up the computer 57
Starting up an application 58
Creating a document from scratch 58

Saving your work 59
Revising an existing document 59
Quitting an application 60
What's next? 60

4 **Macintosh IIx Buses and Ports 63**

The Apple Desktop Bus 64
NuBus 65
The modem and printer ports 66
The SCSI port 67
The audio jack 68

5 **Caring for Your Macintosh IIx 71**

The main unit 72
The monitor 74
The keyboard 74
The mouse 75
3.5-inch disks 76
The clock battery 77
Service and support 78

**Appendix A**
**The Macintosh Product Line 81**

**Appendix B**
**Technical Information 85**

Specifications 86
Programmer's switch 88
Apple Desktop Bus power requirements 89
NuBus power requirements 90
SIMM configurations 91
Pin assignments 93
Macintosh peripheral cables 95

Appendix C
**Connecting SCSI Devices 97**

SCSI cables and terminators 98
Setting the SCSI ID numbers 101

Appendix D
**Guide to Technical Documentation 103**

Technical documentation 104
For more information 107

**Glossary 109**
**Index 127**

## Radio and television interference

The equipment described in this manual generates and uses radio-frequency energy. If it is not installed and used properly—that is, in strict accordance with Apple's instructions—it may cause interference with radio and television reception.

This equipment has been tested and complies with the limits for a Class B computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules. These specifications are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that the interference will not occur in a particular installation.

You can determine whether your computer is causing interference by turning it off. If the interference stops, it was probably caused by the computer or one of the peripheral devices.

If your computer system does cause interference to radio or television reception, try to correct the interference by using one or more of the following measures:

- Turn the television or radio antenna until the interference stops.
- Move the computer to one side or the other of the television or radio.
- Move the computer farther away from the television or radio.
- Plug the computer into an outlet that is on a different circuit from the television or radio. (That is, make certain the computer and the television or radio are on circuits controlled by different circuit breakers or fuses.)
- Consider installing a rooftop television antenna with a coaxial cable lead-in between the antenna and the television.

If necessary, consult your authorized Apple dealer or an experienced radio/television technician for additional suggestions. You may find helpful the following booklet, prepared by the Federal Communications Commission: "How to Identify and Resolve Radio-TV Interference Problems" (stock number 004-000-00345-4). This booklet is available from the U.S. Government Printing Office, Washington, DC 20402.

**△ Important** This product was tested for FCC compliance under conditions that included the use of shielded cables and connectors between system components. It is important that you use shielded cables and connectors to reduce the possibility of causing interference to radios, television sets, and other electronic devices. For Apple peripheral devices, you can obtain the proper shielded cables from your authorized Apple dealer. For non-Apple peripheral devices, contact the manufacturer or dealer for assistance. △

# Welcome to the Macintosh IIx

THIS MANUAL TEACHES YOU ABOUT THE APPLE® MACINTOSH® IIX computer. The Macintosh IIx embodies the same "user-friendly" philosophy as the original Macintosh, while providing an open architecture, faster performance, more memory, and more sophisticated system software. The Macintosh is still easy to learn and use, and more powerful than ever.

## About this manual

Here's what you'll find in this manual:

- Chapter 1, "Getting Started," shows you how to set up your Macintosh IIx and how to start the training disk, *Your Apple Tour of the Macintosh IIx.*
- Chapter 2, "Inside the Macintosh IIx," describes the parts of the Macintosh IIx and what they do.
- Chapter 3, "How the Macintosh IIx Works," explains how the computer hardware and software work together.
- Chapter 4, "Macintosh IIx Buses and Ports," explains the different buses and ports you'll use to attach devices to your Macintosh IIx.
- Chapter 5, "Caring for Your Macintosh IIx," describes how to keep your computer running at peak efficiency.
- Appendix A, "The Macintosh Product Line," is a chart that summarizes the differences between the Macintosh IIx and other models of Macintosh computers.
- Appendix B, "Technical Information," provides specifications, Apple Desktop Bus™ and NuBus™ power requirements, SIMM configurations, pin assignments, and a guide to peripheral device cables.
- Appendix C, "Connecting SCSI Devices," presents information you may need if you plan to attach SCSI devices to your computer system.
- Appendix D, "Guide to Technical Documentation," summarizes the technical documentation available for Macintosh computers and explains the resources available for Macintosh programmers and developers.

You'll find a glossary of Macintosh terms and an index at the end of the manual. Inside the back cover, you'll find a Tell Apple card. After you've spent some time with your computer, be sure to fill out the card and send it in. We want to know what you think about Apple products and training materials.

△ **Important** After using Chapter 1 to set up your Macintosh IIx, you can put this manual aside and go on to other learning materials or start your own work. Read the rest of this manual if you're curious about how the computer works, or use it for reference. △

## About the other manuals

Besides the book you're reading, your Macintosh IIx came with some other manuals. *You won't have to read them all to learn how to use your computer.* They're there to give you information when you need it, but you'll quickly be up to speed with very little "required reading." Here's what the other books are for:

- *Macintosh System Software User's Guide:* This is the manual that explains how to use the *Macintosh System Tools* and *Macintosh Printing Tools* disks that came packed with your computer. After you've set up your computer, this is also the manual you'll use to learn basic Macintosh techniques—the same techniques you'll use whenever you operate the computer. It also teaches you about the Macintosh Finder™—an important program you'll use whenever you work with your Macintosh IIx.
- *Macintosh Utilities User's Guide:* This is the manual that explains how to use the *Macintosh Utilities* disks, which contain special programs you'll use occasionally to customize your system to your specific needs, and to update it and keep it running efficiently.
- *HyperCard User's Guide:* This manual explains an exciting new software product—HyperCard®—that's included free with your Macintosh IIx. HyperCard is a personal toolkit for using, customizing, and creating information. You'll want to read the *HyperCard User's Guide* only after you've become familiar with the Macintosh IIx.

## Using the manuals

You can use these manuals in a variety of ways, depending on your level of computer experience. The following sections suggest approaches to learning about your Macintosh IIx.

### For the beginner

If your computer is already set up, you're ready to turn to the training disk.

If you've never used a Macintosh computer before, follow these steps:

1. Use the instructions in Chapter 1 of this manual to set up your Macintosh IIx.
2. Follow the instructions in Chapter 1 to start the training disk called *Your Apple Tour of the Macintosh IIx,* or go through the tutorial in the *Macintosh System Software User's Guide* to learn basic Macintosh skills. (You may want to use both the training disk and the tutorial; it's up to you.)
3. See the instructions in the *Macintosh System Software User's Guide* to prepare the internal hard disk for use.
4. If you have other devices to attach to your computer, turn to the manuals that came with those devices for instructions on connecting them correctly.
5. Look through the manuals that came with the application programs you'll be using with your computer.

Return to this book if you have questions about the Macintosh IIx or how to care for it. Refer to the *Macintosh System Software User's Guide* for information about Macintosh system software or help in troubleshooting any problems you encounter. Use the *Macintosh Utilities User's Guide* when you need instructions for using utility programs.

## For the experienced user

Even though this manual is written primarily for newcomers to the Macintosh computer, you'll probably want to read the following:

1. Read Chapter 1 for instructions on setting up your computer.
2. Follow the instructions in the *Macintosh System Software User's Guide* to prepare the internal hard disk for use.
3. See Appendix A, "The Macintosh Product Line," for a quick guide to how the Macintosh IIx differs from other models of Macintosh computers.
4. Use the *Macintosh System Software User's Guide* to learn about the new features of Macintosh system software with which you may be unfamiliar.
5. Use the *Macintosh Utilities User's Guide* to learn about utilities that may be new to you.

If you're interested in learning more about the Macintosh IIx, read Chapter 2, "Inside the Macintosh IIx," Chapter 3, "How the Macintosh IIx Works," and Chapter 4, "Macintosh IIx Buses and Ports."

## For the advanced user

If you're looking for technical information about the Macintosh IIx, the appendixes may contain what you need:

- Use Appendix A to determine how the Macintosh IIx differs from other Macintosh models you may be familiar with.
- Look in Appendix B for specifications, Apple Desktop Bus and NuBus power requirements, SIMM configurations, and other technical information.
- Read Appendix C if you need information about connecting SCSI devices to your computer.
- If none of the appendixes has what you're looking for, see Appendix D, "Guide to Technical Documentation"; it will lead you to the appropriate technical manuals. (Appendix D also provides information that may be useful if you're a programmer or developer.)

## Apple user groups

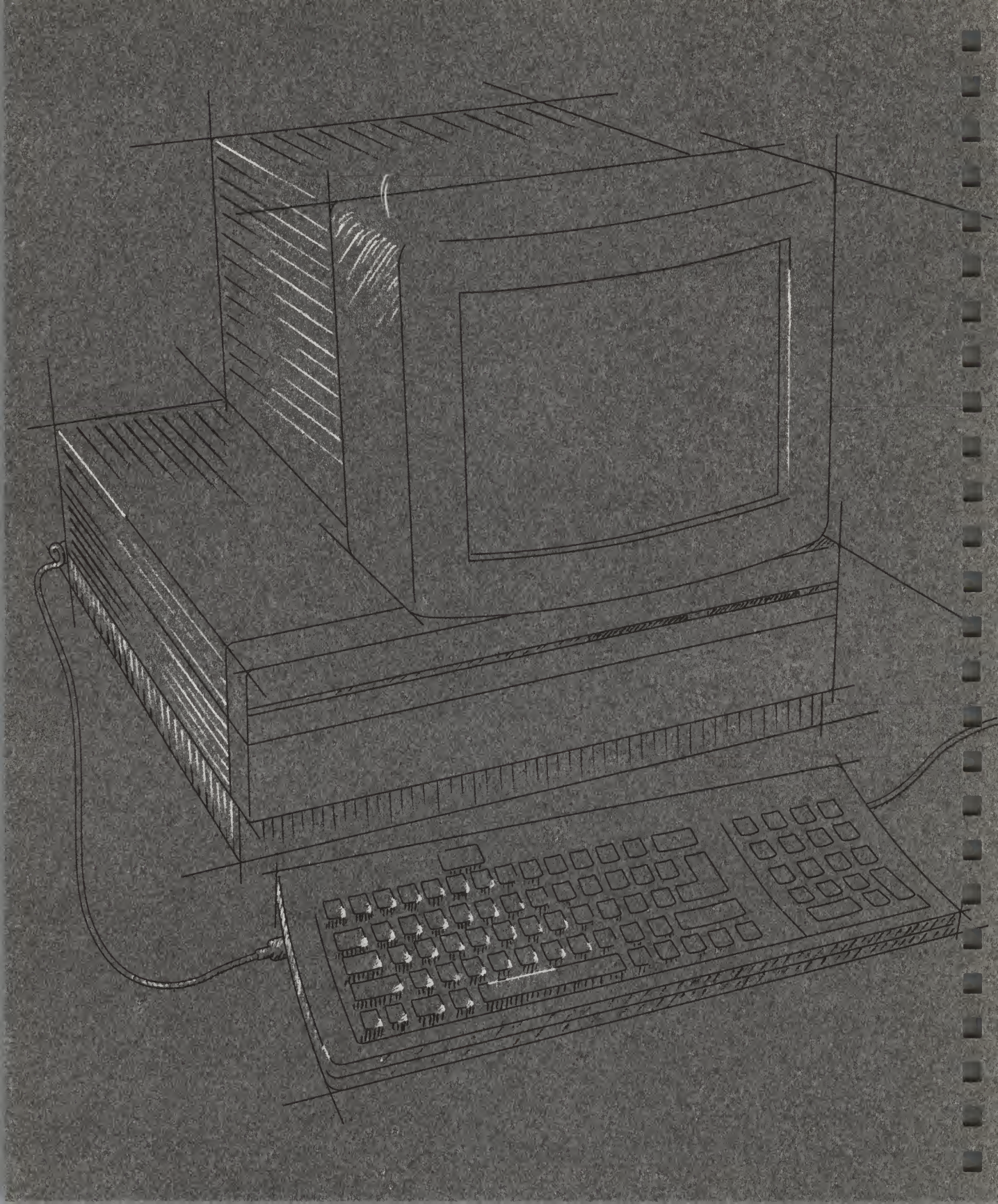
No matter what your level of computer experience, you can get lots of support by joining an Apple user group. Apple user groups are composed of people who work with Apple computers and who enjoy sharing what they know with others. Activities may include new product demonstrations, informal question-and-answer sessions, and regular classes on using popular software applications or learning to write your own programs. Many user groups have special beginners' nights.

Ask your authorized Apple dealer for the name of the Apple user group nearest you, or call 1-800-538-9696. For user groups outside the United States, or if you are interested in starting your own user group, contact either

The Boston Computer Society
One Center Plaza
Boston, MA 02108
(617) 367-8080

or

Berkeley Macintosh User Group
1442-A Walnut Street #62
Berkeley, CA 94709
(415) 849-9114



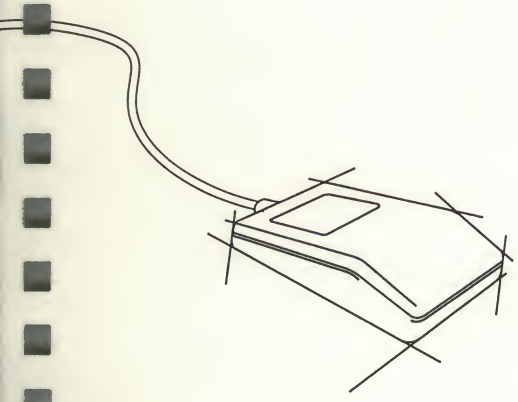
C H A P T E R 1

# Getting Started

THIS CHAPTER WILL HELP YOU GET STARTED WITH YOUR MACINTOSH® IIx computer. You'll find instructions for

- unpacking the equipment
- setting up the Macintosh IIx
- starting the computer
- starting the training disk, *Your Apple Tour of the Macintosh IIx*

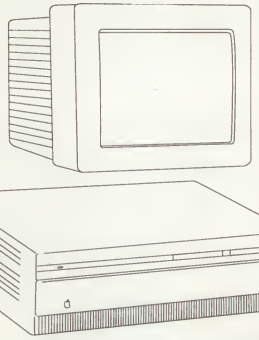
You'll also find important safety instructions.



Unpacking and setting up your Macintosh IIx is easy and takes only a few minutes. If somebody has already set up your computer for you, you can skip most of this chapter; go directly to the "Important Safety Instructions" section and continue on from there.

# Unpacking

The first thing to do is take all the materials out of the packing boxes and make sure you have everything shown here:

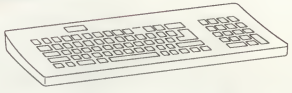


Monitor



Programmer's switch *

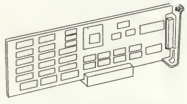
Main unit



Keyboard



Mouse

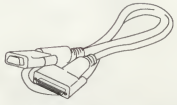


Video card



Packing list
Warranty card

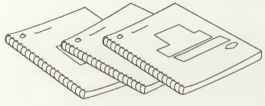
Macintosh Quick
Reference Card



Monitor video cable



Main unit power cord



Macintosh IIx Owner's Guide
Macintosh System Software User's Guide
Macintosh Utilities User's Guide



Monitor power cord



Keyboard cable

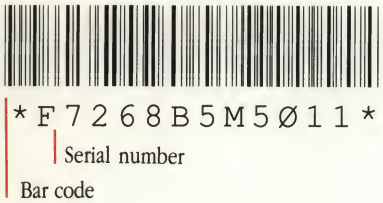


System software, utilities, and
training disks



HyperCard User's Guide
HyperCard disks

* Put this aside for now. You won't install the switch unless you're developing application programs for the Macintosh IIx.




- *Different keyboard?* Apple offers two keyboards for the Macintosh IIx. Yours may look different from the one shown here.

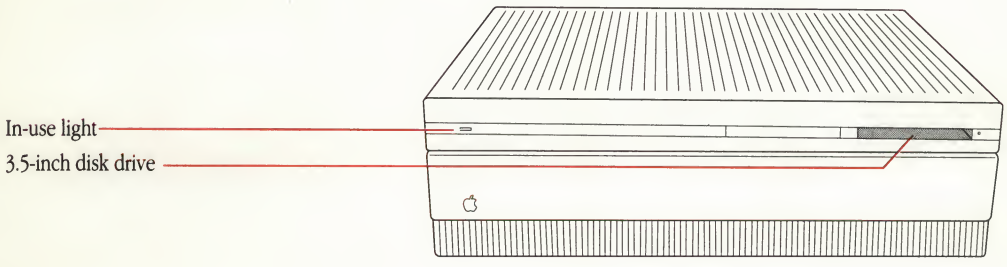
Check your packing lists to make sure you have everything. If something is missing, contact your authorized Apple® dealer or representative.

Be sure to fill out the product registration card and mail it in. The registration card asks for the product serial numbers; you'll find the numbers on either the bottom or the back of each component.)

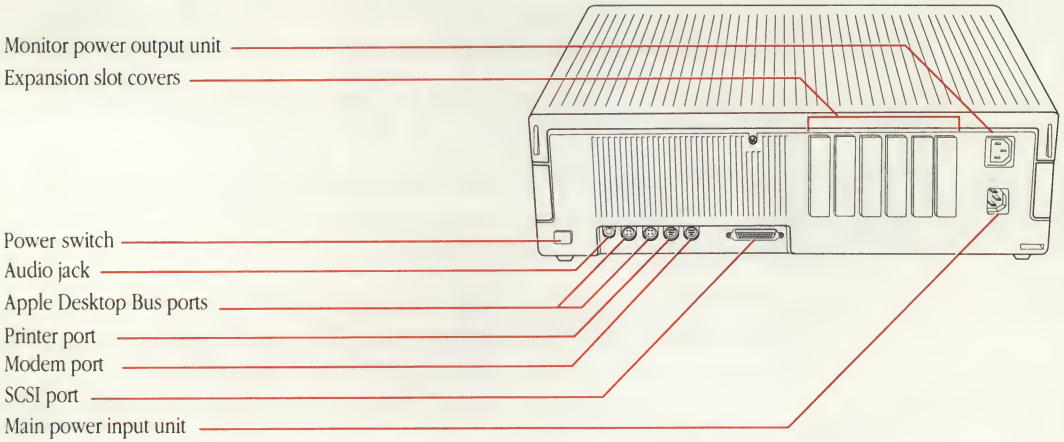
- *Save the packing materials:* Keep the boxes and all the packing materials; repack your computer system to protect it from rough handling and jarring if you have to move it over long distances. It's especially important to repack your computer if it has an internal hard disk drive.

## Taking a closer look

Now that you have unpacked your Macintosh IIx, take a closer look at the main unit so you're familiar with its parts.




Most of the devices you'll use with your Macintosh IIx attach to connectors, or **ports,** on the back panel of the computer. You can usually tell which port to use by looking at the **icons** (small pictures) above each one. (All the ports on the back panel are discussed in more detail in Chapter 4, "Macintosh IIx Buses and Ports.")




**△ Important** One item on the back of the main unit—the power switch—is there when you must use it, but it's not intended for regular use. Normally, you turn the computer on with the Power On key at the top of the keyboard, and you turn it off by choosing the Shut Down command from the Special menu. (Don't worry if these terms are new to you; they're described later in this book and in the *Macintosh System Software User's Guide*.)

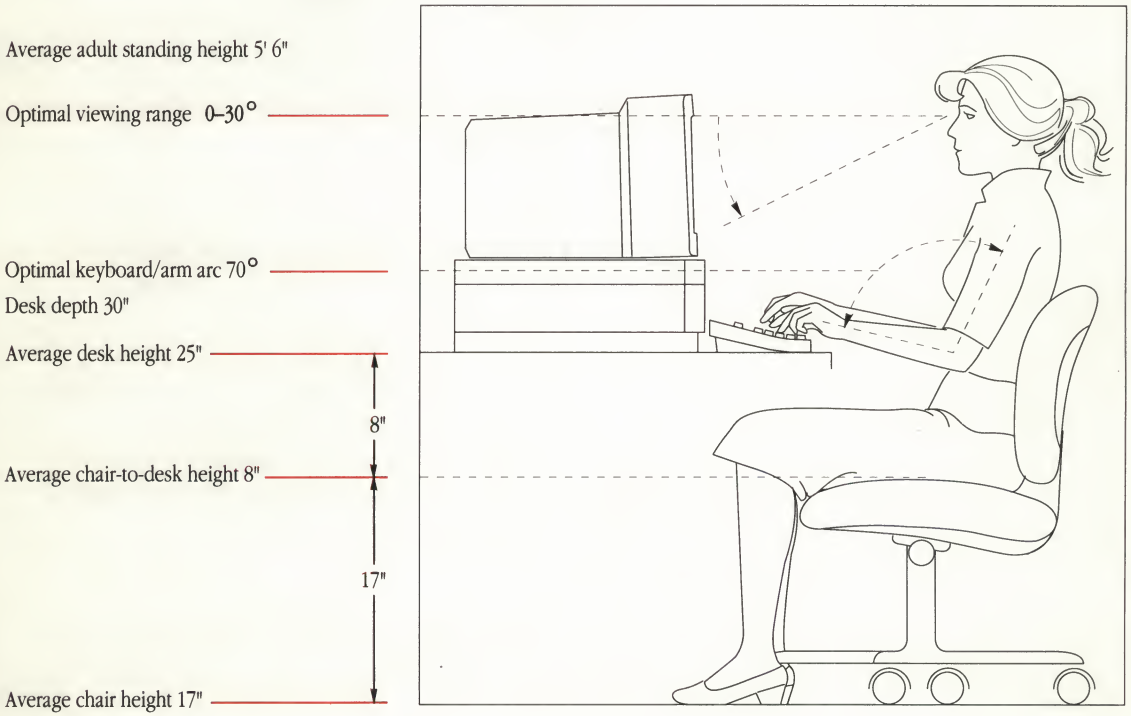
If you encounter a problem with the computer and for some reason cannot use the Shut Down command to turn it off, you can push the power switch instead. (Be sure you only push it once.) Wait a few seconds, and the computer will turn itself off. Then you can start it again by pressing the Power On key. Note that this method of turning the computer off is not recommended, since you will lose any work you had not previously saved on a disk. △

# Basic ergonomics

Before you set up your computer, it's a good idea to prepare your work area. Thinking ahead and paying attention to some basic **ergonomics** will help you avoid fatigue, muscle aches, and eye strain.

Of greatest importance are your work surface height and monitor viewing angle. Your hands should rest comfortably at the keyboard so that your lower arms form a 70° to 90° angle with your torso. The monitor screen should be within a 30° viewing angle; a 15° viewing angle is optimal.

The following diagram presents measurements for a person of average adult height (5 feet 6 inches, or 168 cm, standing). Use the table that follows the diagram as a guideline for adjusting your work surface. If your work surface is not adjustable, you might need to raise or lower your chair. (You may have to experiment a bit with both your work surface height and chair height to find the best arrangement.)



| If you are | | Your work surface should be | |
|---|---|---|---|
| 4 feet 11 inches | 150 cm | 23 inches high | 58 cm |
| 5 feet 4 inches | 163 cm | 24 inches high | 61 cm |
| 5 feet 6 inches | 168 cm | 25 inches high | 64 cm |
| 5 feet 9 inches | 175 cm | 26 inches high | 66 cm |
| 6 feet 2 inches | 188 cm | 28 inches high | 71 cm |

Macintosh computers are designed so that, for most users, the monitor viewing angle will be within 30° once you've found the appropriate work surface height (assuming you're using a single, level work surface.) To avoid monitor glare, try to position your computer so that your light source is neither directly behind nor directly in front of you.

- *Getting it right:* Some furniture manufacturers offer specially designed "computer" desks with separate adjustable surfaces for both the keyboard and the main unit; these offer the greatest range of adjustment. Also available are monitors stands, antiglare screens, and other equipment to make your work environment fit your individual needs.

## Putting it all together

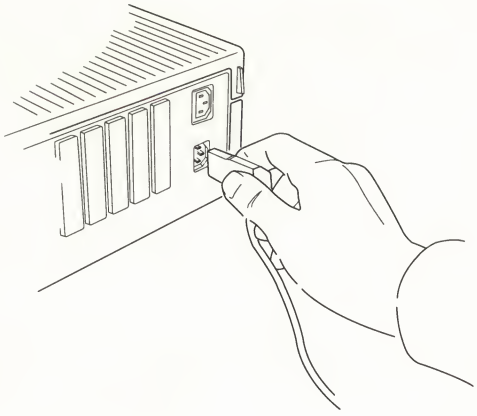
Now that you're familiar with the computer, and have prepared your work area, follow the steps in the next few sections to set up your computer system. Assemble the system in the order given in the next few pages.

### The power cord

The first step in assembling your computer system is attaching and plugging in the power cord. As you assemble your system, keep the power cord plugged in. When properly connected to a grounded outlet, the power cord acts as a ground for the system, protecting its components from static electrical discharge—even when the computer is turned off.

To connect the power cord:

- **Plug the socket end of the power cord into the main power input unit—the bottom receptacle on the right side of the computer's back panel.**



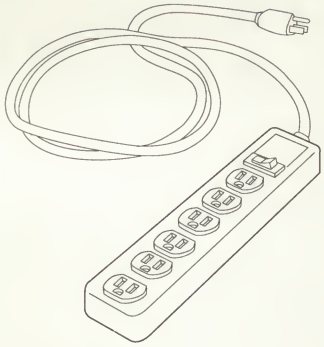
(The connector above the main power input unit is for the monitor power output; you'll read about that in a moment.)

- **Plug the other end of the power cord into a three-hole grounded outlet.**

**▲ Warning** Do not turn on the computer until you've completed the entire installation process. Turning it on sooner could result in electrical shock to you or damage to your computer system's components.

If the power has been on, turn it off and wait at least 5 minutes before connecting anything to or disconnecting anything from the main unit. There are several ways to turn off the computer. If you know how to choose the Shut Down command from the Special menu, do that. If you're unfamiliar with using such commands, push once on the external power switch (on the back of the main unit) and wait for the computer to shut itself off. If all else fails, pull the plug on the power cord from the outlet.

This equipment is intended to be electrically grounded. Your Macintosh IIx is equipped with a three-wire grounding plug—a plug that has a third (grounding) pin. This plug will fit only a grounding-type AC outlet. This is a safety feature. If you are unable to insert the plug into the outlet, contact a licensed electrician to replace the outlet with a properly grounded outlet. Do not defeat the purpose of the grounding plug! ▲



Many computer devices—monitors, printers, modems, and so on—need to be plugged into three-hole, grounded outlets. If you have more than two devices that need to be plugged into the wall, you should get a power strip. Available at any electronics or hardware store, a power strip is like a wall socket with four to eight outlets. Many power strips come with an on/off switch, so you can turn all your devices on and off with one switch. (Some also have a surge protector, which acts like a circuit breaker if there's a surge of power on the incoming electrical lines.)

## The monitor

Apple Computer provides both color and monochrome monitors for the Macintosh IIx. The basic installation procedure is the same for all monitors: you connect the monitor to your computer through the socket on a video card installed in an expansion slot in the computer's main unit.

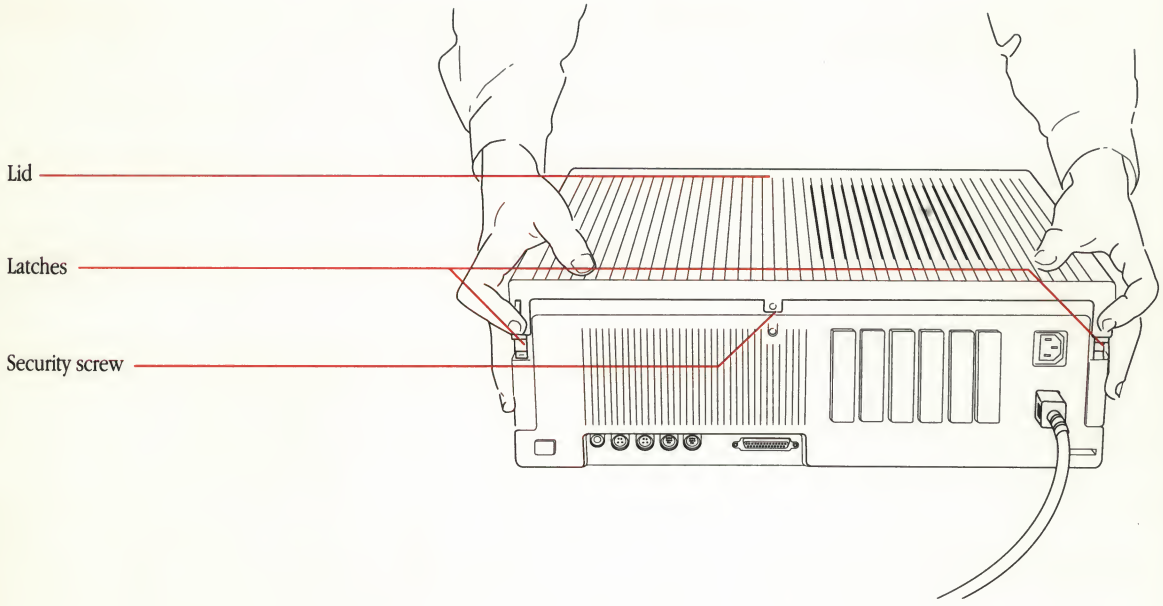
Here are the major steps involved in attaching your monitor, followed by specific steps for each stage of the procedure:

- installing the video card in the main unit
- connecting the monitor's video cable
- connecting the monitor's power cord

### The video card

Follow these steps to install the video card:

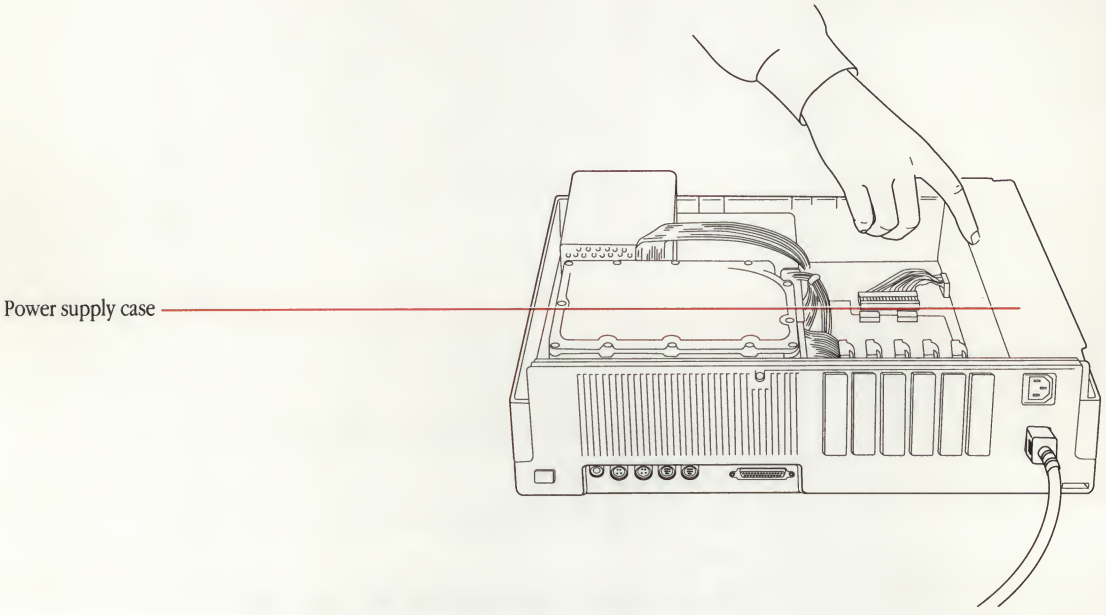
- **Remove the lid from the computer's main unit.**
  - Using a Phillips screwdriver, loosen and remove the security screw that holds the lid to the main unit. (It's at the top center of the rear panel.)
  - Wrap your hands around the rear corners of the case.




- Press on the latches as you lift up on the back of the lid.
- Gently move the lid back and away from the main unit's case. (The lid needs to clear three small hooks inside the front of the main unit's case.)
- Lift the lid all the way off the case and put it aside.

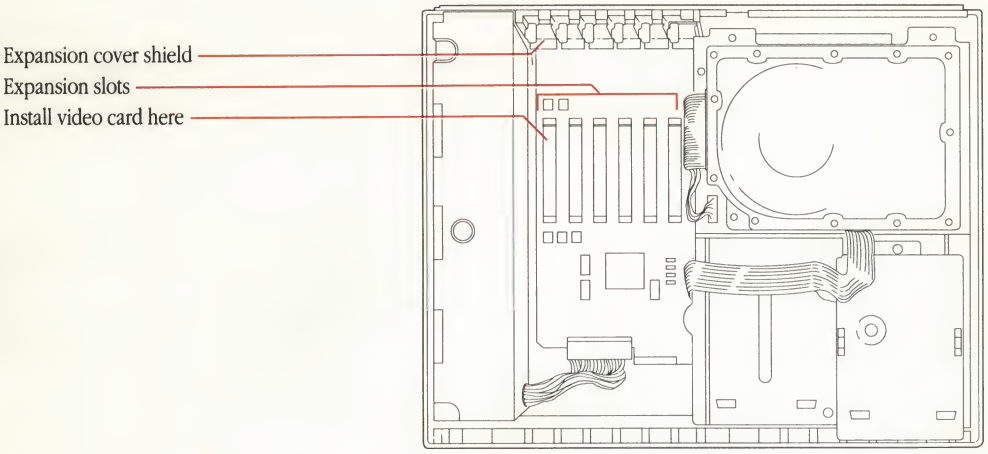
- **Touch the power supply case inside the computer to discharge any static electricity that might be on your clothes or body.**

**▲ Warning** It's OK to touch the power supply if you've just unpacked the computer. However, the power supply can get hot during normal use. If the computer has been on, shut it off and wait at least 5 minutes before touching the power supply. ▲



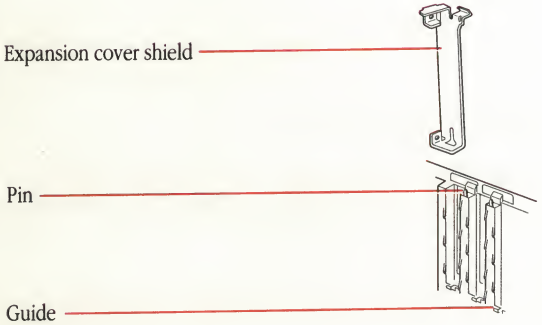

■ **Choose the expansion slot you want to use.**

The expansion slots are the narrow, plastic strips running along the bottom of the main unit, near the back. It doesn't matter which one you choose.

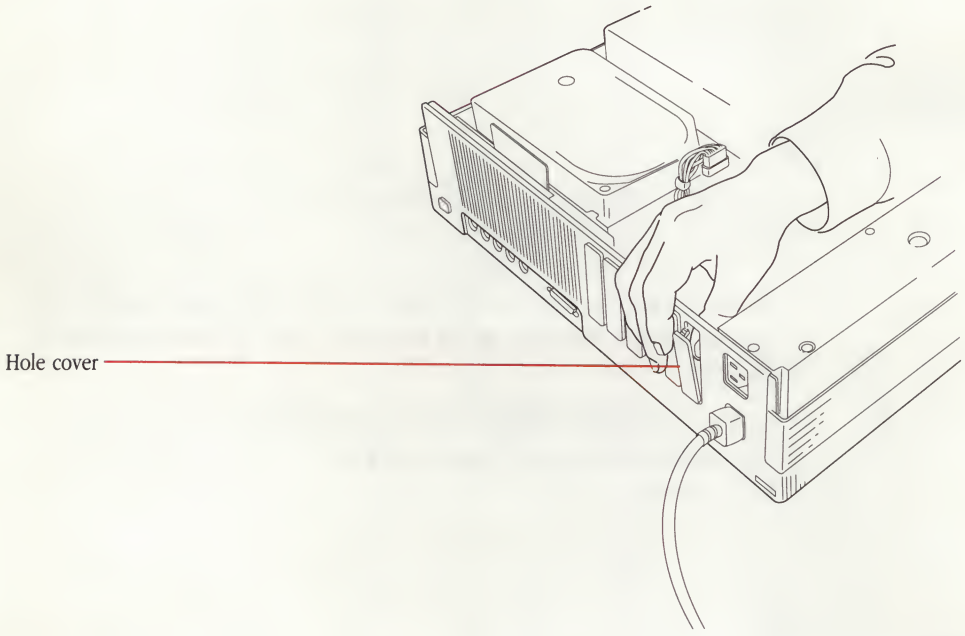



- **Remove the expansion cover shield behind the expansion slot you've chosen by lifting it up until the shield is free of the guide and pin.**

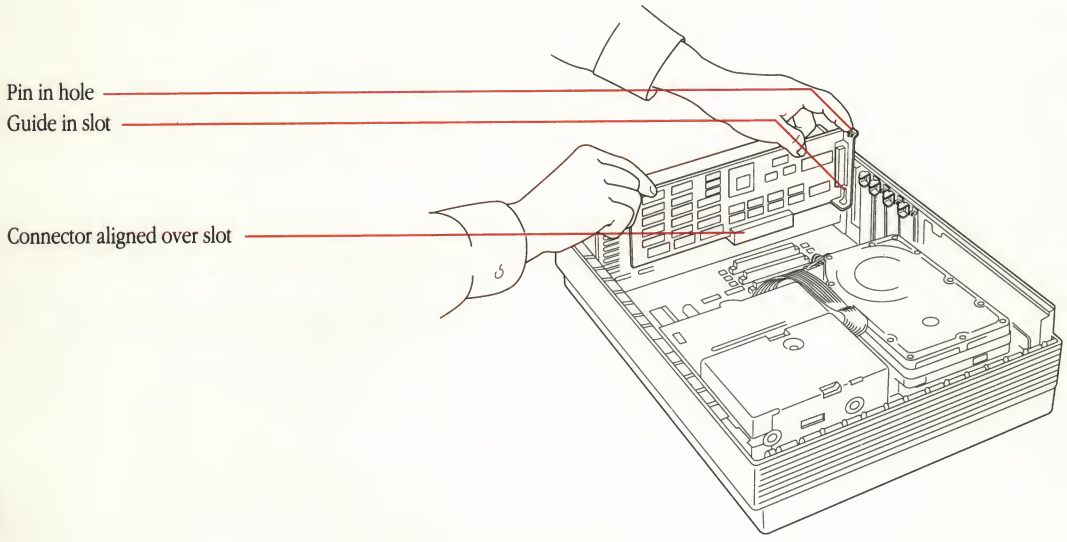
  Save the shield; you will need it later if you take the card out of the slot. The card itself has a shield attached to it that will replace the shield you just removed.



- **Push out the plastic hole cover that lines up with the slot.**
  - Grasp the cover with your thumb inside the computer and your fingers outside.
  - Push the cover out with your thumb, and set the cover aside.



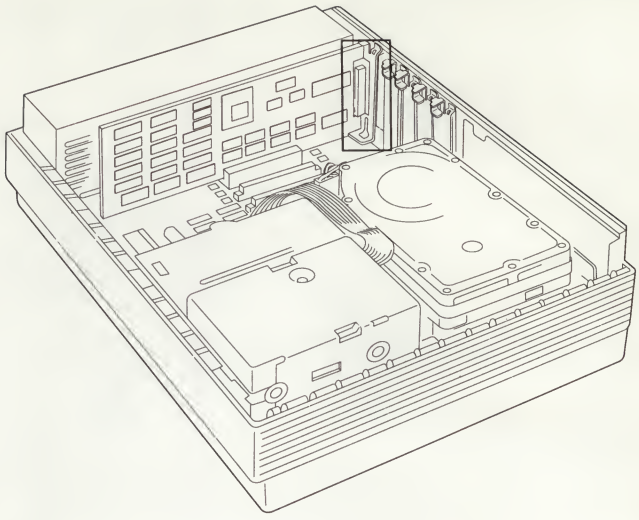

- **Insert the video card into the expansion slot.**
  - Pick up the video card by the top of the metal bracket and the top of the card's other end. (Be careful not to touch the pins on the bottom edge of the card.)
  - The expansion cover shield on the card attaches to the inside of the back panel in the same way as the shield you just removed. Align the card so that the guide fits through the lower slot in the shield on the card and the pin sticks up slightly through the hole at the top of the shield.




- Align the connector on the bottom of the card directly over the slot.
- Place one hand along the top edge of the card, directly over the connector area; push down firmly on the card until the connector is fully seated.

△ **Important** Don't force the card. If you meet a lot of resistance, pull the card out and try again.

Don't wiggle the card from side to side when you insert it; this puts unnecessary stress on the card and slot. △

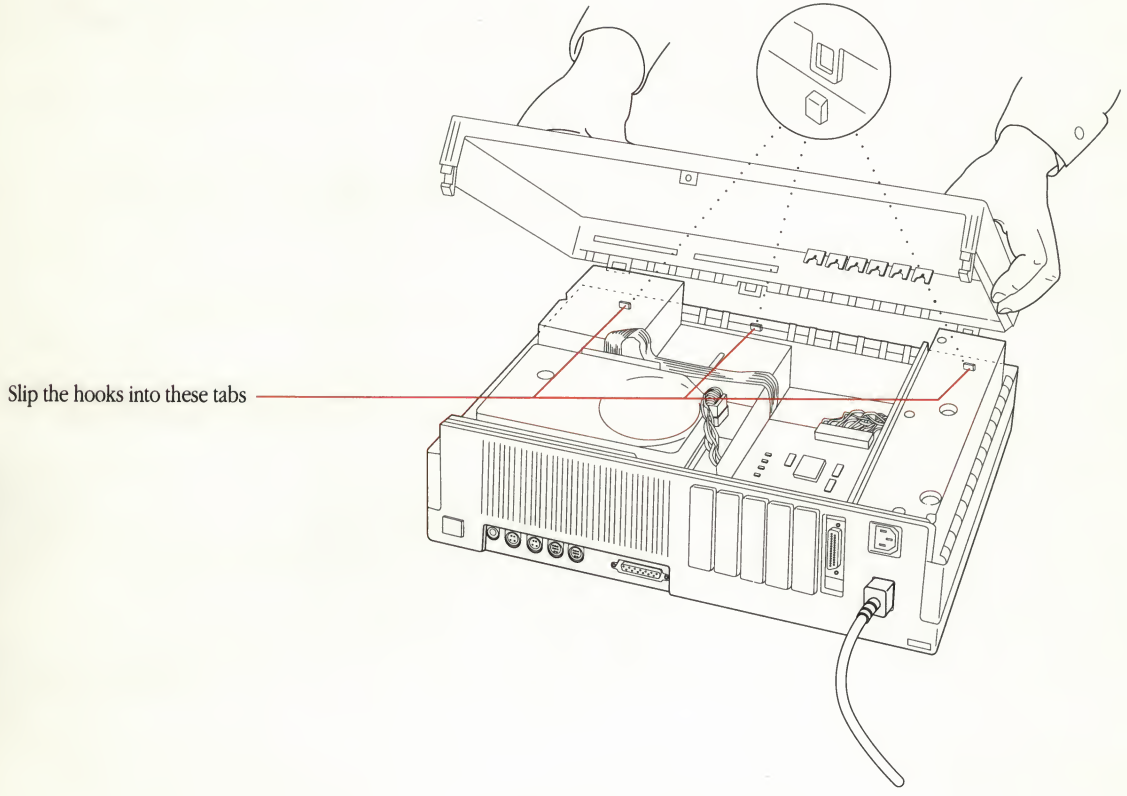


You can test to see whether the card is properly connected by lifting the card gently. If it resists and stays in place, it's connected.

**△ Other cards?** If you have purchased other peripheral devices that require cards, install them now, too. You can use the method described above to install all expansion cards in your Macintosh IIx at any time. If the computer has been running, let it cool down for 5 minutes before you open up the main unit. Of course, you should also read and follow any instructions included with the other expansion cards.

If you plan to install more than one card, see the "NuBus Power Requirements" section in Appendix B for details on the power available for the expansion slots. △

- **Replace the lid on the main unit.**
  - Tip the front of the lid down so it catches the three hooks under the lid in the front of the main unit's case.
  - Lower the back of the lid onto the case and press firmly on the back corners until you hear the rear latches snap into place.
  - Replace and tighten the security screw.




## The video cable

With the back of the main unit facing you, place your monitor near the main unit. Turn the monitor so its back panel is also facing you. Then follow these steps to connect the video cable:

- **Plug one end of the video cable (both ends are the same) into the video socket on the back of the monitor.**

  The socket is marked with a video icon.

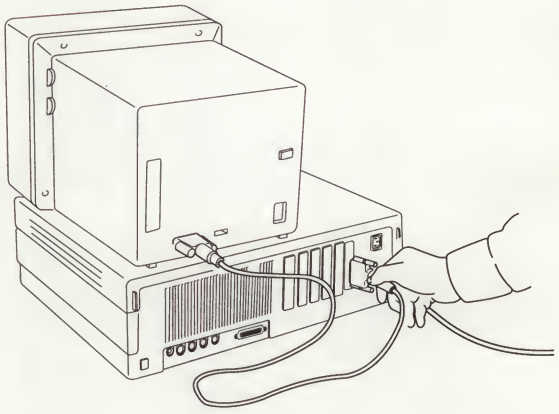
- **Tighten the thumbscrews on the connector.**

  A tight connection keeps the cable from coming loose, and prevents radio and television interference.

- **Plug the other end of the video cable into the socket on the video card and tighten the thumbscrews.**

  Connect the cable to the card through the opening in the computer's back panel.

  - *More than one card?* If you have installed more than one expansion card, make sure you plug the video cable into the *video* card.



## The monitor's power cord

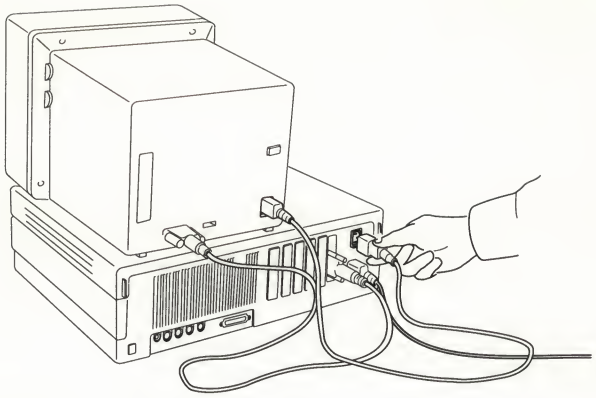
Follow these steps to connect the monitor's power cord.

- **Plug the socket end of the power cord into the monitor power input unit on the back of the monitor.**

  The plug is marked with a power icon.

- **Connect the other end of the power cord to the monitor power output unit on the back of the computer.**

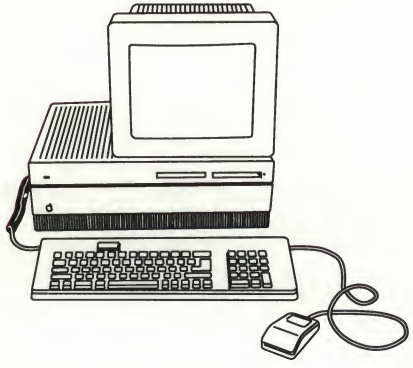
  The monitor power output unit is on the right side of the computer's back panel, just above the main power input unit.



For information about adjusting brightness and contrast (and alignment, if you have a color monitor), see the manual that came with your monitor. But wait to do this until you've attached the mouse and the keyboard.

## The mouse and the keyboard

There are several ways to connect the mouse and the keyboard. The steps that follow describe how to connect the mouse to the keyboard and then how to connect the keyboard to the main unit. When you've completed this procedure, you'll find information on other ways to connect these devices.



△ **Important** These steps are presented in this order so that the last thing you do is connect the keyboard to a power source. (Once the keyboard has power, accidentally pressing the Power On key will turn your computer on prematurely.) △

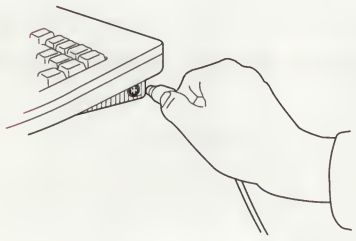
Your Macintosh IIx works with a variety of keyboards. Although they may look different, you attach them to the main unit in the same way.

Place your keyboard near the back of the main unit with the keyboard facing you. Then follow these steps:

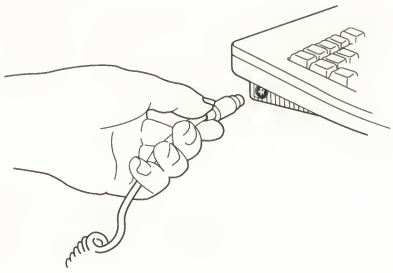
- **Plug the mouse cable into the port on the right side of the keyboard.**

  If you're left-handed, you may want to plug it into the port on the left side instead.

  This arrangement is known as a **daisy chain.** (In effect, the mouse will be connected to the computer through the keyboard.)

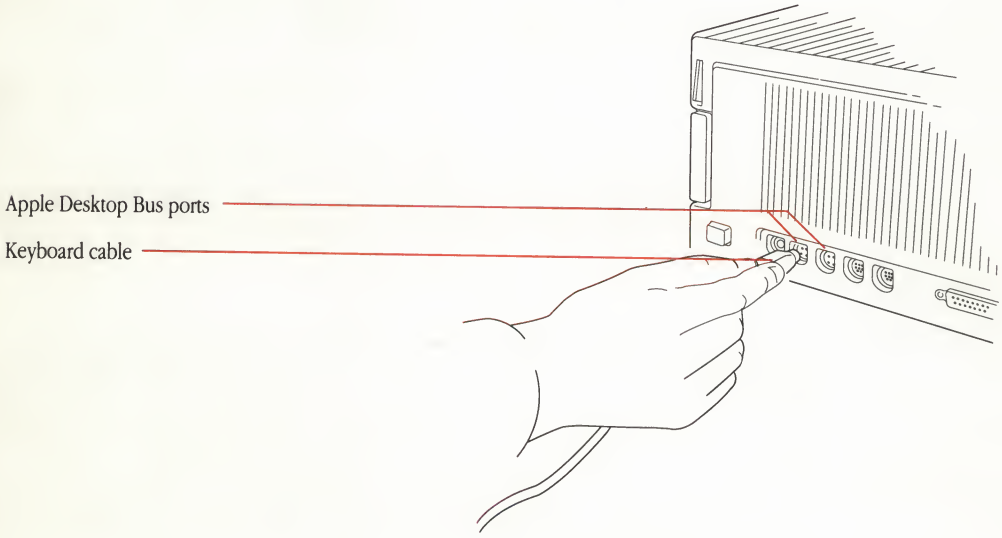


- **Plug one end of the keyboard cable into the other port on the keyboard.**



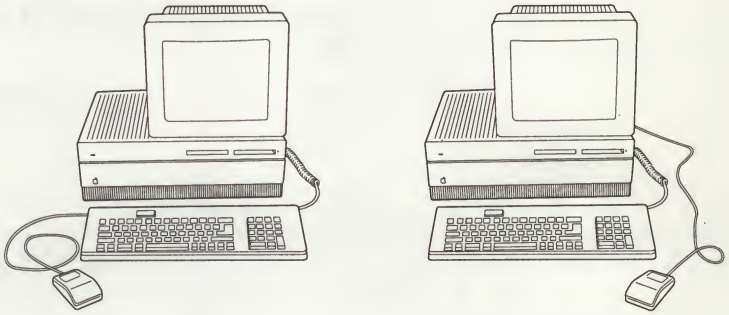
- **Plug the other end of the keyboard cable into either of the two Apple Desktop Bus™ ports on the left side of the main unit's back panel.**

  Always hold the cable by the connector as you push it into or pull to out of a port.



The **Apple Desktop Bus** is so named because several different devices (the keyboard, the mouse, and other Apple Desktop Bus devices, such as a graphics tablet, a joystick, or another keyboard) can send information along one "bus line" to the computer. Your Macintosh IIx has two Apple Desktop Bus ports.

You may prefer a left-handed configuration, or you might prefer to plug the mouse into the other connector on the back of the Macintosh IIx, leaving the second connector on the keyboard free. Here are some alternatives:



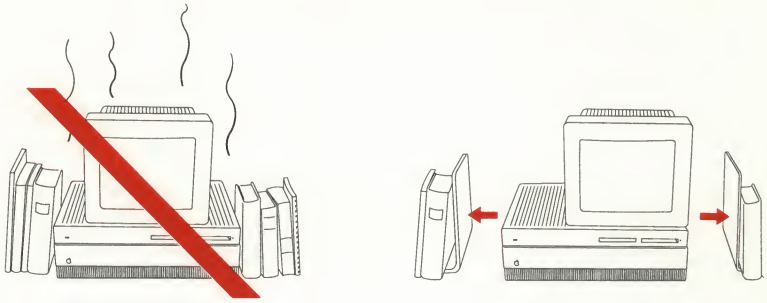
If you have other Apple Desktop Bus devices to attach to your system, you can either daisy-chain them to the keyboard or use one of the ports on the computer's back panel.

△ **Important** If you need to rearrange the devices on the Apple Desktop Bus while using your system, turn off the computer before connecting or disconnecting any devices. △

## Ready to go?

Once you're satisfied that everything is connected properly, you'll want to arrange your Macintosh IIx components conveniently in your work area. Turn the main unit so that it's facing you. Place the monitor where you want it (on top of the main unit is fine), and position the keyboard and mouse where you can reach them comfortably.

Note that if you place your monitor on top of the main unit, it should sit at least 8 mm (.314 inches) above the surface. Apple monitors come with small rubber "feet" to raise them to the correct height, letting air circulate properly.



**▲ Warning** Always keep your computer's main unit flat, sitting on its rubber feet. Standing it on edge defeats the cooling design and is likely to make your computer overheat. This will eventually damage the main unit. Underwriters Laboratories (UL) and the Canadian Standards Association (CSA) have tested and approved the Macintosh IIx in the horizontal position only. ▲

## Other devices

You may have purchased other computer equipment—a printer, an external hard disk drive, or a modem, for instance. You'll find instructions for connecting those devices in the manuals that came with them. Whether you set them up now or wait until later depends on how familiar you are with using a Macintosh: some devices require an understanding of how to use Macintosh system software and utilities for you to complete their setup procedures. If you are new to the Macintosh, you may want to put the other components aside for now and continue on in this chapter.

**▲ Warning** Some devices may be SCSI devices. (*SCSI* stands for *Small Computer System Interface.*) Connecting SCSI devices incorrectly can damage your system. If any of your devices are SCSI devices, read Appendix C, "Connecting SCSI Devices," *before* connecting them. (The manual that came with the device should tell you if it's a SCSI device.) ▲

### Internal hard disk

Your system includes an internal hard disk drive that you might need to prepare for use; the procedure is explained in the *Macintosh System Software User's Guide.* For the veteran Macintosh user, it's easy—read the next section, "Important Safety Instructions," and then go to the system software guide to prepare the hard disk. If you're a newcomer, skip setting up your hard disk for now and continue on in this chapter. After you've mastered some Macintosh techniques, then go to the *Macintosh System Software User's Guide* to prepare the hard disk.

## Important safety instructions

Before you start your Macintosh IIx, read these important safety instructions. For your own safety and that of your equipment, always take the following precautions.

Disconnect the power plug (by pulling on the plug, not the cord) under these circumstances:

- if the power cord or plug becomes frayed or otherwise damaged
- if anything is spilled into the equipment
- if your equipment is exposed to rain or any other excess moisture
- if your equipment is dropped or the case has been damaged
- if you suspect that your computer needs servicing or repair
- whenever you clean the case

Be sure you always follow these precautions:

- Keep all air vents clear. Leave at least 4 to 6 inches of clearance between the vents on both sides of the main unit and any object that may restrict air flow. If you place your monitor on top of the main unit, make sure it sits at least 8 mm (.314 inches) above the surface of the main unit. (Apple monitors come with small rubber "feet" to raise them the correct distance, allowing air to circulate properly.)
- Keep your equipment away from any source of liquid. If you drink a beverage while you're at your computer, take care not to spill.
- Protect your equipment from damp or wet weather.
- Keep these instructions handy for reference.
- Follow all instructions and warnings dealing with your system.

**▲ Warning** Electrical equipment may be hazardous if misused. Operation of this product or similar products must always be supervised by an adult. Do not permit children to handle cables. ▲

## Starting up the computer

Follow these steps to start up your Macintosh IIx:



- **Turn your computer on by pressing the Power On key (at the top of the keyboard).**

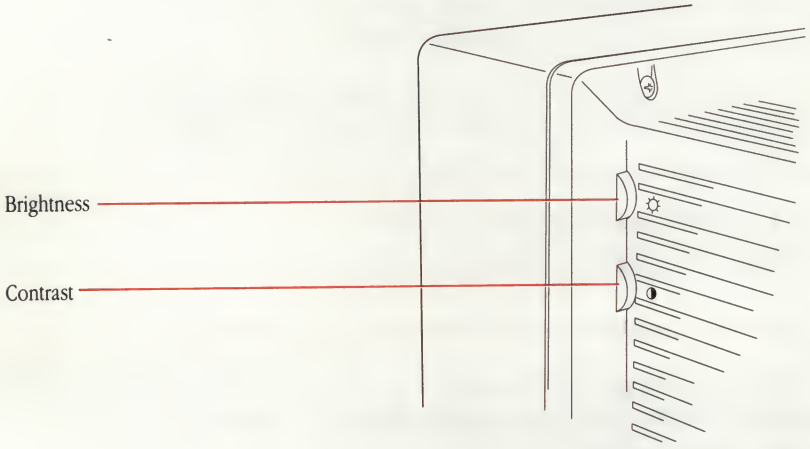
  A moment after you press the Power On key, a tone sounds to indicate that the computer has been turned on. After a few seconds, the monitor's screen begins to glow.



An **icon** (a small picture) representing a Macintosh disk appears on the screen. The blinking question mark shows that the Macintosh IIx is ready for you to insert a disk.

- **Adjust the brightness and contrast controls on your monitor to the level you want.**

  See the manual that came with your monitor for instructions.




△ **Important** If you see something other than the question mark icon on your screen, someone may already have prepared the internal hard disk for you. For now, just turn off the Macintosh IIx and continue on in this chapter. To turn the computer off at this time, push once on the power switch on the back of the main unit. △

## Training disk or tutorial?

Before you begin learning how to operate your Macintosh IIx, you have a choice to make. The material presented in the training disk called *Your Apple Tour of the Macintosh IIx* is also taught in a tutorial in the *Macintosh System Software User's Guide.* Both are designed to give you first-hand experience using the computer, but in different ways.

The training disk is an interactive guide to the Macintosh IIx. That means it teaches you Macintosh concepts and techniques, prompts you step by step, and corrects you when you've made a mistake. It provides you with an entertaining, controlled learning environment.

The tutorial uses real software applications to teach you the same techniques, but in more depth. You'll be learning in the same working environment that you'll use whenever you work with your Macintosh IIx. Even with the actual software applications, you won't make any mistakes if you follow the instructions step by step. Whether you use the disk or the tutorial is up to you. Many people find it helpful to use both.

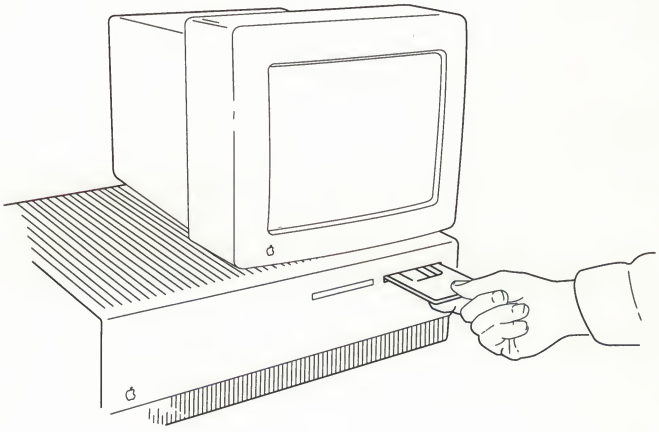
If you would like to take the guided tour, follow the steps in the next section, "The Training Disk." If you'd rather stay with the printed page, skip now to the first chapter of the *Macintosh System Software User's Guide.*

## The training disk

Follow these steps to start up *Your Apple Tour of the Macintosh IIx:*

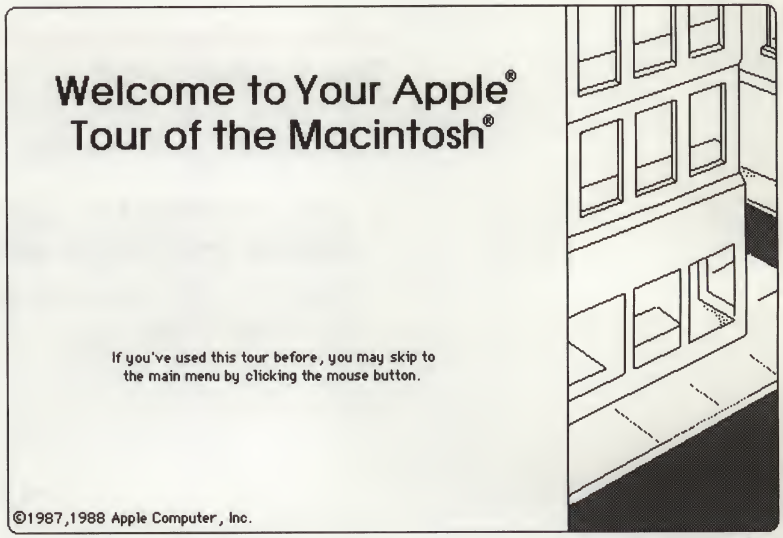
- **Insert the disk labeled *Your Apple Tour of the Macintosh IIx* into the disk drive, metal end first, label side up.**

  If your system includes a second internal 3.5-inch drive, insert the disk in the drive on the right.



If you switched off the computer earlier after seeing something other than the question mark icon on your screen, insert the training disk now and switch the computer back on by pressing the Power On key. This should get you started correctly.

When the disk is most of the way into the disk drive, the Macintosh IIx automatically pulls it in and into place. The soft hum you hear is the Macintosh IIx starting up the training disk. After a few moments, you should see a display welcoming you to the guided tour.



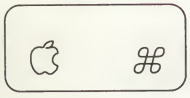

- **Follow the instructions that appear on the screen.**

Use the training disk as long as you like. Anything you need to know to use the disk will be explained right on the screen.

## Problems starting up?

If you don't see the opening display, go through the following list to see if you can identify the problem:

- Is the computer plugged into a power source?
- If your computer is plugged into a power strip, is the power strip turned on?
- Is the monitor connected to the computer properly?
- Is the monitor power cord plugged in?
- Is the computer turned on? (Look at the in-use light on the front left side of the main unit.) If the light is not on, press the Power On key.
- Is the monitor on? (Look at the in-use light on the front of the monitor.) See the manual that came with the monitor if necessary.
- Is the brightness control adjusted correctly?
- Are you using the correct disk? To check, hold down the Command and Shift keys while you press the 1 key on the main keyboard. This will eject the disk. (You'll learn more appropriate ways to eject disks later, but use this shortcut for now.) If it is the correct disk, reinsert it into the disk drive (the rightmost drive, on two-drive systems).
- If the internal hard disk drive has already been prepared for you, did you turn off the Macintosh IIx before inserting the disk?



Command key

If you can't identify the problem yourself, get help from a more experienced Macintosh user or from your authorized Apple dealer or representative.

## Stopping

When you're ready to stop using the training disk:

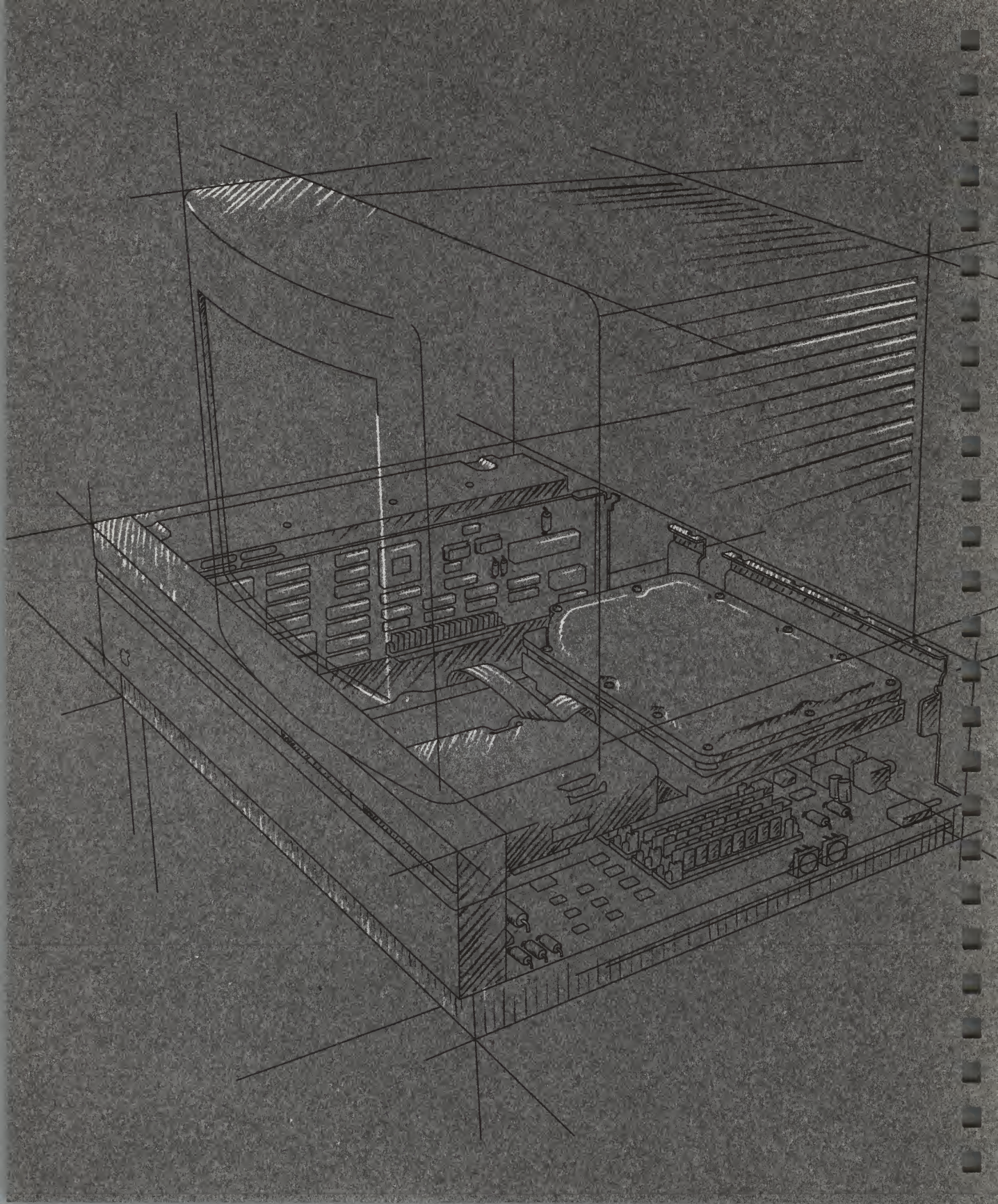
- **Click the "Quit the Tour" button in the main menu and answer "Yes" to the question that appears on the screen.**

  This will shut down the computer and eject the disk.
- **Take the disk out of the drive.**

- **To continue working with the Macintosh IIx, you can do any of the following:**
  - Go through the written tutorial in the *Macintosh System Software User's Guide* for some additional practice.
  - Insert the *Macintosh System Tools* disk, press the Power On key to restart the computer, and experiment with the Finder. (Make a copy of this disk and set the original aside for safekeeping; you'll find instructions for copying disks in the *Macintosh System Software User's Guide*.)
  - Start any of your applications (following the instructions in the manual that came with the application).
  - Go to the *Macintosh System Software User's Guide* to get your internal hard disk set up and running.

**△ Important** You may have to use the Installer on the *Macintosh System Tools* disk to update the system software on your application disks before they'll work on the Macintosh IIx. You'll find instructions for using the Installer in the *Macintosh System Software User's Guide*.

If you're uncertain whether you need to update the disk, go ahead and try the disk first. If you get unexpected results—if your keyboard doesn't work correctly, or if the application behaves strangely—these are indications that you probably need to update the system software. △



CHAPTER 2

# Inside the Macintosh IIx

IF YOU USED THE TRAINING DISK, *YOUR APPLE TOUR OF THE MACINTOSH IIX,* OR went through the tutorial in the *Macintosh System Software User's Guide,* you've already learned the basic skills you'll use to work with your Macintosh IIx computer. The next two chapters expand on what you've learned.

This chapter briefly introduces you to the more important parts of the Macintosh IIx—the basic hardware components of your computer system. Chapter 3 describes how they work together with software.

You don't need to know the material in this chapter or in Chapter 3 to use your Macintosh IIx. But a basic familiarity with how a Macintosh works will help you understand advanced concepts that you may encounter in using system software and applications. It may also come in handy when considering hardware options and peripheral devices for your computer.

Here's a list of what you'll read about in this chapter:

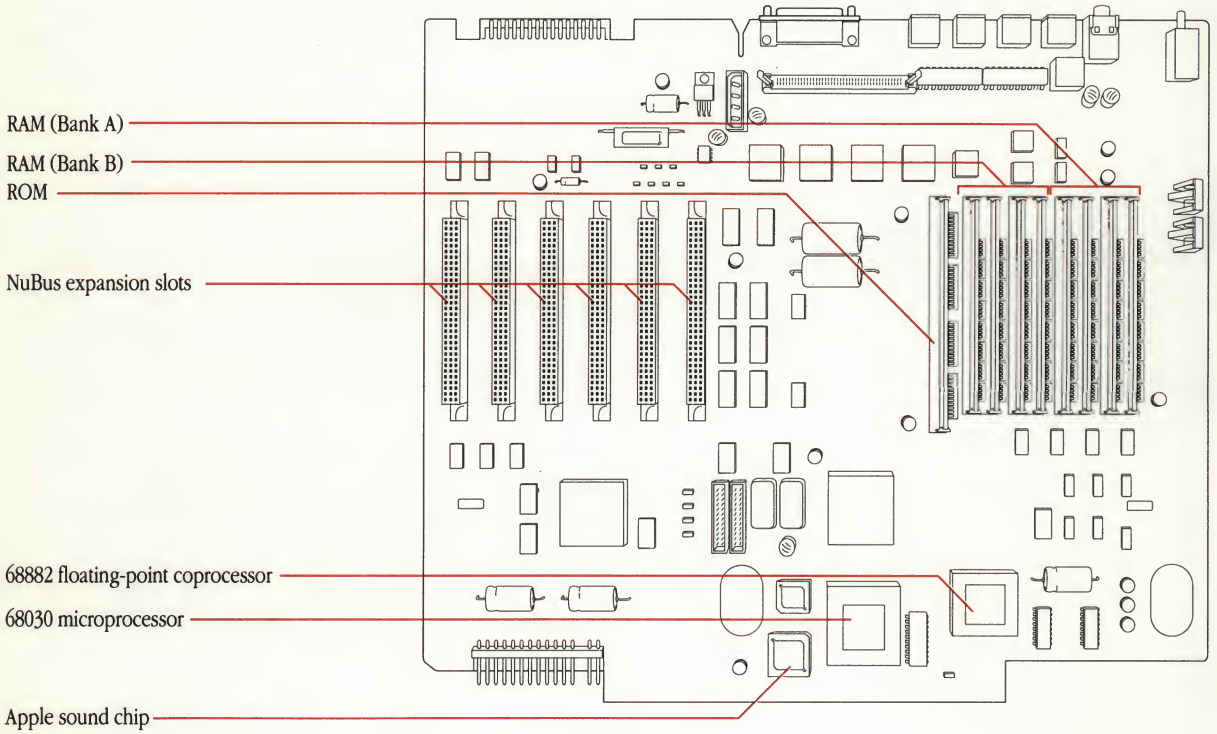
- the microprocessor
- coprocessors
- RAM and ROM
- video displays
- disk drives and disks
- the mouse and the keyboard

## The microprocessor

The **microprocessor** is an integrated circuit, or chip, on the computer's main circuit board that processes the instructions supplied to it by software. In a sense, the microprocessor is the computer's "brain": it controls the computer by directing the flow of electrical impulses, and thereby coordinates the efforts of the other parts of the machine. When the microprocessor receives an instruction, it interprets the instruction and tells the other parts of the computer what they should do.

The instructions that the microprocessor receives are in the microprocessor's own vocabulary, known as the microprocessor's **instruction set.** Each microprocessor on the market understands its own set of instructions. The microprocessor for the Macintosh IIx, the **Motorola 68030,** uses an instruction set particular to it.

■ Macintosh IIx main circuit board




Software programs are normally designed to run on specific microprocessors. That's one important factor that determines whether software is **compatible** with the computer system you want to run the software on. Earlier models of Macintosh computers contain either the **Motorola 68000** or the **Motorola 68020**—both predecessors of the 68030 microprocessor. However, software designed for these earlier microprocessors is still compatible with the newer 68030 because the 68030 instruction set includes all the instructions for both the 68000 and the 68020.

Inside the microprocessor are **registers**—areas where instructions and data are stored temporarily while the microprocessor works with them. The microprocessor uses **buses** to communicate with the other parts of the computer, such as the other chips on the main circuit board. The **address bus** is the circuit the microprocessor uses to indicate the source or destination of data. The **data bus** is the path over which data is sent.

A **bus** is a circuit that acts as a common connection for a number of devices.

A microprocessor's performance is determined, in part, by the width of its registers and buses, measured in **bits.** The wider the address bus, for instance, the more specific locations the microprocessor can use to store data. The wider the data bus, the more data the microprocessor can move at one time. The registers, address bus, and data bus for the 68030 are all 32 bits wide. (The 68000 has 32-bit registers, but uses a 24-bit address bus and a 16-bit data bus.) This means that applications written specifically to take advantage of the full 32-bit buses will run very fast.

The term **bit** is a contraction of the phrase *binary digit,* the smallest unit of information the microprocessor can process.

Because applications written for earlier models of Macintosh computers expect only a 24-bit address bus, and because newer software for the Macintosh IIx uses the full 32-bit addressing, the Macintosh IIx functions in either a 24-bit or 32-bit mode.

## Bits and bytes

Information is processed and stored in computers as electrical charges. A computer contains thousands of minute electrical circuits connected by switches that can be in only one of two states: opened or closed. An open switch does not complete a circuit, so no electrical charge can pass. A closed switch completes a circuit, allowing the charge to flow through it. An open switch is therefore off; a closed switch is on.

A **binary** numbering system is used to represent these two conditions. 0 means off; 1 means on. Each 0 or 1 represents one binary digit, or **bit.** Each letter, number, and punctuation mark on

## Coprocessors

A **coprocessor** is a chip designed to assist the microprocessor, usually in performing very specialized tasks. The Macintosh IIx comes with one standard coprocessor and can also accept others on expansion cards installed in **NuBus**™ expansion slots.

**NuBus** is a hardware feature described in Chapter 4, "Macintosh IIx Buses and Ports."

The Motorola 68030 is the primary processor for the Macintosh IIx, but the system also includes the **Motorola 68882 floating-point coprocessor.** It's sometimes referred to as *floating-point unit,* or *FPU.* The term *floating-point* refers to the method, similar to scientific notation, of performing calculations on large numbers; it provides much greater speed and flexibility.

Scientific notation is a method of writing numbers in terms of powers of ten. For example, the number 20,687 would be represented as $2.0687 \times 10^4$.

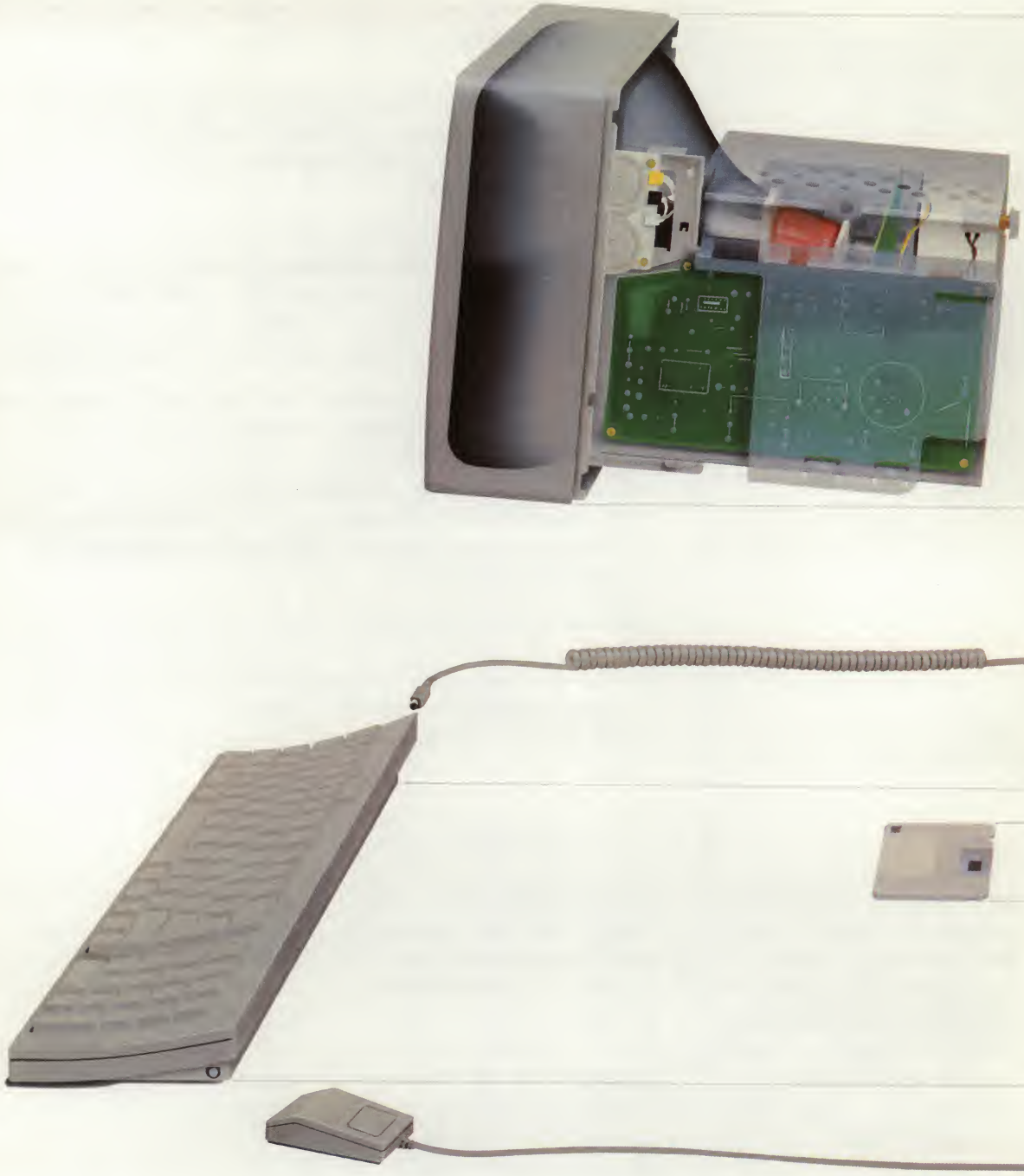
The 68882 is located on the computer's main circuit board. It takes over many mathematical processing functions that would otherwise have to be performed by the 68030. The 68882 performs the kinds of arithmetic calculations that make most spreadsheet programs run much faster. It performs algebraic and trigonometric computations that are necessary for generating sophisticated graphics for computer-aided design and three-dimensional modeling in general.

Other coprocessors come on their own NuBus expansion cards. Some are designed to run software that isn't ordinarily compatible with the primary processor for the Macintosh IIx. This is possible because control of the computer is handed over to the coprocessing chip on the card—in effect, turning the Macintosh into another type of computer system.

---

the keyboard has its own distinct arrangement of eight bits, called a **byte.** Most computers use a standardized system for the binary representation of characters called **ASCII,** an acronym that stands for American Standard Code for Information Interchange, and is pronounced "ASK-ee."

Counting individual bytes would result in astronomical numbers; it's more often convenient to use larger units, such as **kilobytes** and **megabytes.** A kilobyte is 1024 bytes (2 to the tenth power) and represented with a KB, or more informally, **K.** A megabyte is 1024 kilobytes, and represented with an MB. You'll often hear computer memory, disk storage space, and application and document sizes described in K's or MB's. For instance, the text of this manual occupies about 275K, or 281,600 bytes; the minimum amount of RAM in the Macintosh IIx is 4 MB, or 4096K.





## RAM

Your Macintosh IIx uses two types of **memory,** both contained in more chips connected to the computer's main circuit board. **RAM** is one type; its name is an acronym that stands for *random-access memory*. RAM is the computer's working area, the primary location where the microprocessor stores the information it needs. It's called *random-access* because of the microprocessor's ability to get at information in memory randomly by knowing its location, or address, rather than by having to hunt through memory sequentially from beginning to end, as you would with a cassette recorder when you're looking for a particular song.

Because information in RAM is stored electronically, the microprocessor can access data stored there very quickly. But because it is stored electronically, all information in RAM is temporary: when you switch off the computer, everything in RAM disappears. (That's why you must save your work on a more permanent storage medium, such as a disk.)

When you start up an application, the microprocessor finds the application at its permanent location on a disk, and transfers a temporary copy of the application (or segments of it) into RAM. And when you create a document with the application, the document is stored there, too. The amount of space in RAM is therefore an important factor in how complex the application can be and how large a document you can create with it. The Macintosh IIx comes with a minimum of 4 megabytes (4 MB) of RAM. If you need more space, RAM in the Macintosh IIx can be expanded by installing additional RAM chips.

Extra RAM means you can work with more sophisticated applications, or work with more applications open at the same time. Extra RAM can also increase the computer's performance. For instance, the microprocessor may occasionally need to go to the disk drive to load in segments of an application program, if the application is too large to fit entirely into RAM. Additional RAM cuts down on disk access time by allowing more of the application's **code** to reside in RAM rather than on the disk.

**Code** is another term for computer instructions.

RAM chips are contained on small circuit boards called **SIMMs** (an acronym for Single In-line Memory Module). The Macintosh IIx has eight SIMM sockets on its main circuit board that you can use to install extra SIMMs. You need to be careful to arrange the SIMMs in the correct manner; see the "SIMM Configurations" section in Appendix B.

## Paged memory management

**Multitasking** means the computer can perform more than one task at the same time. Usually, this means you can run more than one application concurrently. UNIX is a widely used, very powerful operating system developed by AT&T.

**Multitasking** environments such as A/UX®, Apple's version of UNIX, rely on a feature called *paged memory management.* It's a technique that allows the microprocessor to access a much greater amount of data than can fit in RAM at one time. It's called *paged* because of how it manages data in memory. A page is a fixed-size chunk of memory that is swapped in and out from the disk.

Many microprocessors require a dedicated paged memory management coprocessor, often referred to as a **Paged Memory Management Unit,** or PMMU; the PMMU keeps track of pages in memory. The Motorola 68030, however, is designed to handle paged memory management on its own. When the 68030 tries to access a memory location that's not in RAM (that is, any data not in one of the pages), the page containing the data is swapped in from the disk to RAM.

## ROM

**ROM** is another type of computer memory; its name is an acronym that stands for **read-only memory.** It's called read-only because the microprocessor can read and use the information in the ROM chip, but it can't store anything there. The contents of ROM are permanent and cannot be erased or changed.

Whereas RAM chips store both applications and data that change every time you use your computer, ROM chips contain information that never changes. And unlike the contents of RAM, the information in ROM stays intact when you turn off the computer. The ROM holds important instructions that the microprocessor needs to make the computer work. These instructions are just like other forms of software instructions, but because they are permanent and unchangeable, they are often referred to as **firmware.**

Perhaps more than any other part of the system, the features of the Macintosh ROM are what give the Macintosh computer its distinctive "user-friendly" interface. The ROM contains built-in libraries of over 700 **routines** (sequences of instructions). These routines can be broken down into two general categories: the Macintosh Operating System and the User Interface Toolbox.

- The **Macintosh Operating System** routines take care of basic tasks such as starting the system, moving data to and from disks and peripheral devices, and managing the memory space in RAM.
- The **User Interface Toolbox** provides application program developers with hundreds of routines for creating applications that conform to the standard **Macintosh User Interface.** That means programmers can start with a consistent set of templates for windows, dialog boxes, icons, menus, and so on. Their application programs borrow these common elements from the Macintosh ROM. The fact that almost all applications use the same ROM routines assures you, the user, a very high level of consistency among Macintosh applications.

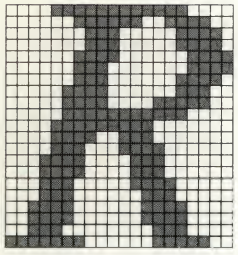
The **Macintosh User Interface** provides a consistent way for you to interact with all Macintosh computers and the applications designed to run on them.

Like RAM, the Macintosh IIx ROM chips are contained on a SIMM that's installed in its own ROM SIMM socket.

## Video displays

The Macintosh IIx does not have a built-in monitor; it supports a variety of stand-alone color and monochrome display devices that you connect to the system through interface cards plugged into NuBus expansion slots. Apple Computer offers high-resolution monochrome and high-resolution RGB monitors for the Macintosh IIx. Both use a cathode-ray tube (sometimes abbreviated CRT) similar to those found in common televisions. In both, the video display is created by a moving electron beam inside the picture tube that scans across the screen. As it scans, it turns on and off to create tiny dots. These dots are called **pixels** (short for picture elements).

To present a screen image, the electron beam starts at the top-left corner of the screen and scans horizontally from left to right, turning on and off to create individual pixels, forming a line of graphics. Each time the scanning beam reaches the right edge of the picture, it flicks invisibly back to the left edge and down a pixel to the beginning of the next line, much as you move your eyes when you read a line of print. When the scanning beam reaches the bottom-right corner of the picture, it flicks back to the top-left corner and begins rescanning, or "refreshing," the screen. This process happens too quickly for the human eye to detect, so the image appears constant.



The pixels on a Macintosh IIx display are represented by bits stored in an area on the video card called the **screen buffer.** (The screen buffer actually resides in RAM chips on the video card.) The number of bits used to display each pixel varies, depending on the type of video card installed in the system and the number of chips on the card. With some monochrome monitors, each bit in the screen buffer corresponds, or is "mapped," to one pixel on the display. In this case, bits whose value is 0 are displayed as white dots (background), and bits whose value is 1 are displayed as black.

Most Macintosh IIx video cards, however, represent each pixel with more than one bit. The additional bits provide more information about each pixel. On a monochrome display, the extra bits control the intensity of the pixels, allowing for a variety of shades of gray, each shade defined by a certain level of brightness. With color monitors, the extra bits determine the number of colors on the display. Pixels on an **RGB** color display are made up of red, green, and blue beams of light, each aimed to create one dot whose color is a blend of the three primary colors. Different colors are created by varying the intensity of each of the three beams.

**RGB** stands for red-green-blue, the three primary colors blended to create the spectrum of colors on a color display.

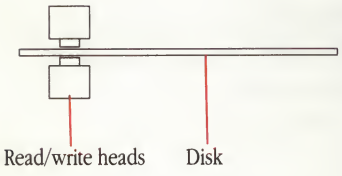
The Macintosh IIx Video Card supports 1, 2, and 4 bits per pixel; with a Video Card Expansion Kit, the card can support 8 bits per pixel. If 2 bits are available per pixel, 4 (or $2^2$) colors or grays can be displayed; with 4 bits per pixel, 16 (or $2^4$) colors or grays can be displayed; and 8 bits per pixel allow 256 (or $2^8$) colors or grays.

A video card's **palette** is the total number of colors a video card is capable of generating.

This can be misleading, however. In an RGB display using eight bits for the intensity value of each of the red, green, and blue beams, the video card's **palette** is $2^{24}$ ($2^8$ for each red, green, and blue beam), or 16,777,216, different colors. A video card may have a palette of over 16 million colors, but the monitor can display only 256 at one time. To select the colors you want displayed on your monitor screen, you use the Control Panel desk accessory in the Apple menu. For instructions on using the Control Panel, see the *Macintosh System Software User's Guide*.

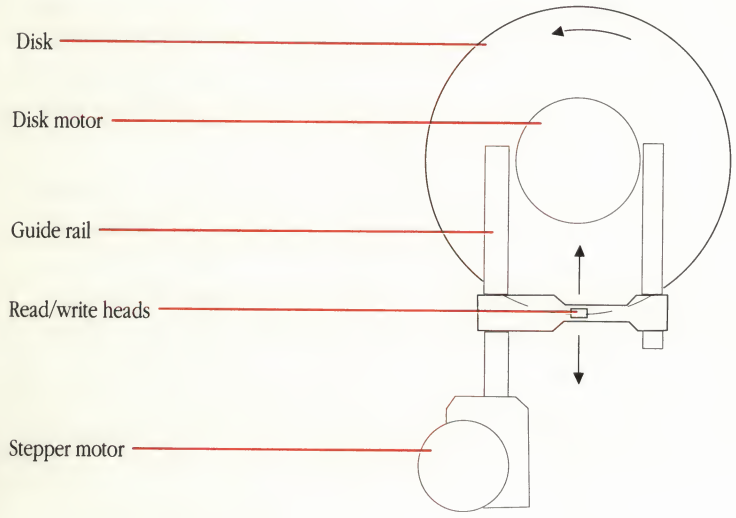
## Disk drives and disks

A computer would be of little use if you couldn't load information into RAM or if you couldn't store your documents after you'd finished working with them. Since the contents of RAM disappear when you shut off the computer, your applications and data must be stored on a more permanent medium. That's the function of **disk drives** and **disks.** Disk drives record information on thin, circular disks, coated with a magnetic surface. Macintosh computers use two types of disks—**3.5-inch disks** (sometimes called "floppies") and **hard disks.**



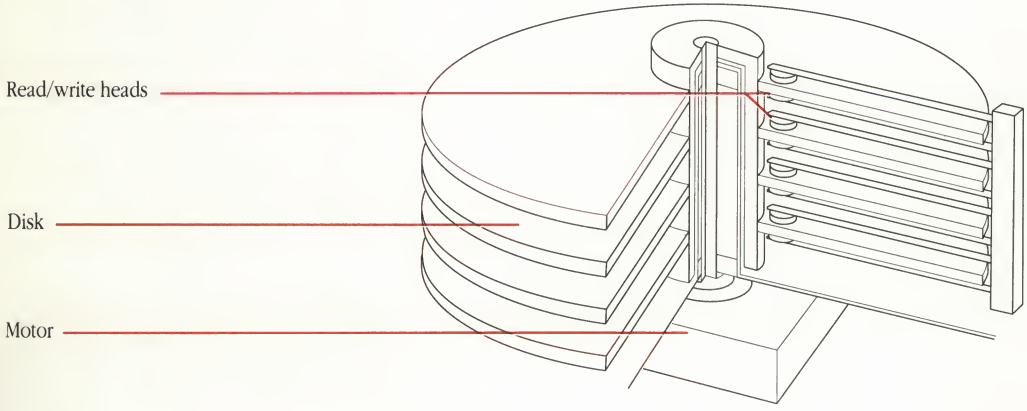

The 3.5-inch disk drives in the Macintosh IIx contain two read/write heads, similar to the recording heads in a cassette recorder. When you insert a disk in the drive, a lever moves the spring-loaded shutter aside. This exposes the disk's magnetic surface to the read/write heads, which are positioned opposite each other with the disk's surface between them. When the disk drive is in use, the drive's stepper motor moves the read/write heads radially across the disk's surface while the disk motor spins the disk.

■ 3.5-inch disk drive




Hard disk drives record information in the same manner as 3.5-inch disk drives. But instead of thin, flexible plastic, hard disk drives use rigid metal disks encased permanently inside the drive. Hard disk drives contain one or more disks, depending on the overall storage capacity of the drive, each disk with its own pair of read/write heads. Unlike 3.5-inch disks, which turn inside the drive only when the operating system is storing or retrieving data, the disks inside a hard disk drive spin continuously whenever the power is on.

■ Hard disk



Hard disks have two advantages; they hold many times more information than 3.5-inch disks, and the operating system can store and retrieve information much more quickly. Whereas a 3.5-inch disk typically holds about 5,000 bits per inch, or *bpi* (11,000 bpi on a 1.4-MB high-density, 3.5-inch disk), hard disks can hold from 12,000 to 15,000 bpi. And because hard disks spin at much faster speeds, information can be written on them or read from them much more quickly than with 3.5-inch disks.

Apart from storage capacity and speed, the two types of disks actually work in much the same way. For the operating system to locate information on disks, the magnetic surface of the disk is divided into concentric circles, or **tracks,** and each track is divided into **sectors.** When you insert a blank disk in a disk drive (or when you use a hard disk for the first time), the disk drive must format, or **initialize,** the disk's surface. This involves setting magnetic markers for each track and sector and creating an index, or **disk directory,** that will record the specific locations of data stored on the disk.

## GCR or MFM?

Not all operating systems format disks in the same way. Generally, most operating systems can recognize a disk formatted in only one of two "standard" formats: Macintosh computers use a Group-Coded Recording (GCR) format for 400K and 800K disks; IBM and IBM-compatible systems recognize the Modified Frequency Modulation (MFM) format. Basically, the difference between the two formats is the way in which information is stored on the disk.

The difference in disk formats accounts for some of the problems associated with using computer files interchangeably among computers that have different operating systems. However, the Apple FDHD™ (a high-density disk drive) in your Macintosh IIx helps to bridge that gap: it is able to format disks in either GCR or MFM, and to read and write files already stored on disks of either format.

On Macintosh systems with Apple FDHD, 400K and 800K disks use GCR, and 1.4-MB disks (and 720K disks) use MFM.

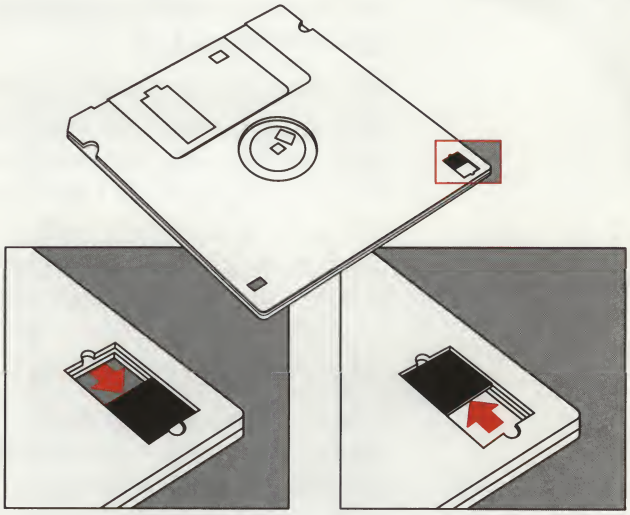



When you save a file on a disk, the operating system looks in the disk directory for free storage space, moves the read/write heads to the free sectors, and writes the data. It then records a directory entry for the file. Later, when you open the file's icon from the Finder desktop, the operating system looks again in the disk directory, finds the file's name and location on the disk, moves the read/write heads to the appropriate sectors, and begins reading the file into RAM.

The operating system doesn't store information on the disk right away. When you first open a disk's icon from the Finder desktop, the operating system sets aside a portion of RAM as a **disk buffer,** which acts as a temporary storage area. As a time-saving measure, most applications write changes to the disk buffer in RAM and then only periodically transfer those changes to the disk itself. That's why you shouldn't remove a 3.5-inch disk from the disk drive manually: you must use the Finder to eject the disk because the operating system needs to record the contents of the disk buffer onto the disk before ejecting it.

Disks are permanent storage devices, in the sense that once a file has been saved on a disk, you can shut off the computer and the information is still recorded magnetically on the disk. But disks are reusable. Individual files can be removed (by dragging their icons to the Trash), and the sectors formerly used for storing that file can be used again. Removing a file doesn't actually erase any data; it merely lists those sectors as free for future storage in the disk directory. Reinitializing the disk erases all the data from the disk and creates a new disk directory.

If you want some added assurance that the contents of a disk won't be changed or erased inadvertently, you can **lock** a 3.5-inch disk by sliding the small tab toward the edge of the disk to expose the little hole beneath it.




When a disk is locked, you can't add new information to it or change any information on it. You can open and print the documents it contains, but you won't be able to save, delete, rename, move, duplicate, or change any information on it. (Some applications won't work if they are on a locked disk.) To allow the disk to be altered again, just slide the tab to cover the hole.

# The mouse and the keyboard

The mouse and the keyboard are tools for communicating with your Macintosh IIx. They are your computer's primary **input devices.**

## The mouse

The Macintosh mouse is a hand-operated device that lets you easily control the location of the pointer on your screen and make selections and choices with the mouse button. Coupled with the graphic elements of the Macintosh User Interface—icons, windows, pull-down menus, and so on—the mouse makes ordinary operation of the system almost effortless: you view your work on the screen and interact with it merely by pointing with the mouse and clicking the mouse button.

The Macintosh mouse contains a rubber-coated ball that rests on the surface of your working area. When the mouse is rolled over that surface, the ball turns two rotating axles inside the mouse. The axles track vertical and horizontal motions. As the axles turn, detectors register the changing position, and a small integrated circuit inside the mouse signals the operating system to move the pointer on your screen accordingly. (There's also a third axle that helps balance the ball and keep it rolling smoothly.)

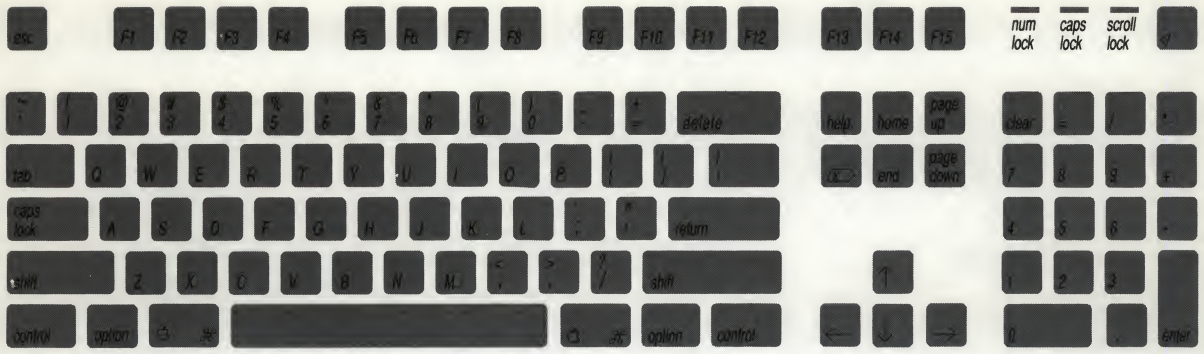
The mouse registers relative movement only; the operating system can tell how far the mouse has moved and in which direction, but not the mouse's absolute location. That's why you can pick up the mouse and move it to another place on your table or desk surface and the pointer will not move. You can adjust the speed with which the pointer on the screen responds to the mouse's movements by using the Control Panel desk accessory in the Apple menu.

## The keyboard

The keyboard is another tool for communicating with the computer. Apple offers two choices of keyboards for your Macintosh IIx system: the Apple Keyboard and the Apple Extended Keyboard. Both keyboards have a common set of keys; the Apple Extended Keyboard has additional keys that you may be familiar with if you've worked with applications that run on other operating systems such as MS-DOS or UNIX. With appropriate software, these additional keys can be programmed for special purposes and used with Macintosh applications, too.

Macintosh keyboards include all the keys you'd normally find on a typewriter keyboard. You'll also find a built-in numeric keypad that lets you enter numbers and numeric symbols more quickly than by using the number keys on the top row of the main keyboard. (But most applications accept numbers and symbols from either the main keyboard or the numeric keypad.) The numeric keypad is especially useful when you use the Calculator desk accessory, a built-in calculator you can choose from the Apple menu.

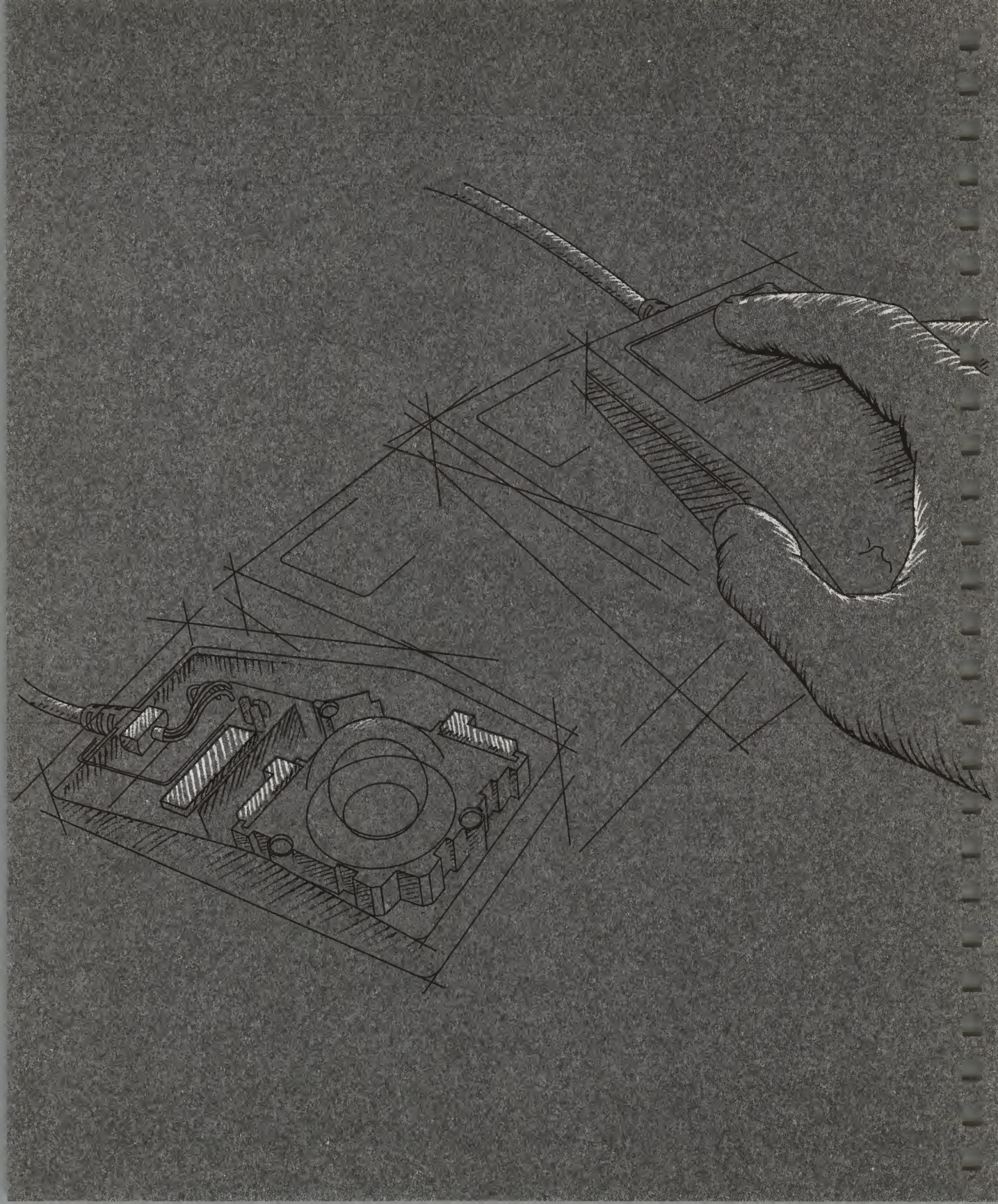
In addition to character keys (that is, keys that produce text characters), there are special keys on Macintosh keyboards that allow you to produce alternate character sets or to duplicate actions you'd normally perform with the mouse. If you're accustomed to function keys on other types of computer keyboards, or if you just want to use keyboard shortcuts, you can use the special keys on the keyboard instead of the mouse for most operations. (For more information on special keys, see the *Macintosh System Software User's Guide.*)




Apple Extended Keyboard




Apple Keyboard



C H A P T E R 3

# How the Macintosh IIx Works

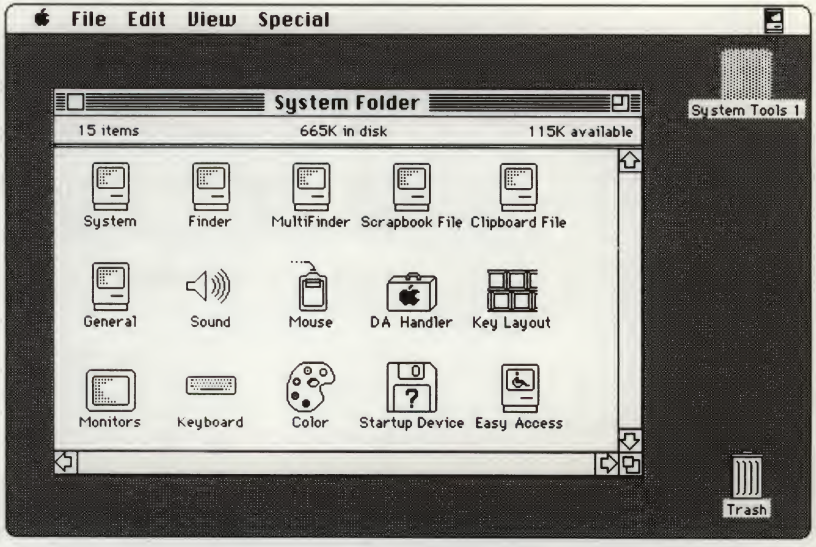
IN CHAPTER 2, YOU LEARNED ABOUT THE HARDWARE COMPONENTS OF YOUR Macintosh IIx computer. Another essential part of the computer system is software, the instructions that determine how the hardware will perform. This chapter provides a brief introduction to a particular type of software—system software—and then explains how Macintosh hardware and software work together.

## System software

Of course, the Macintosh IIx hardware is useless without software, the instructions programmed to make the machine perform its varied tasks. **System software** is one type of software: it's called *system software* because it's an essential collection of programs that the computer *system* needs before you can use it. It's also called *system software* to distinguish it from *application software,* the specific applications—word processing and spreadsheet applications, for instance—that you use to perform your work.

For a more detailed discussion of system software and the contents of the System Folder, see the *Macintosh System Software User's Guide.*

Though technically the routines in ROM are also considered system software, the phrase *system software* generally refers to a set of disk-based programs and files contained in a disk's **System Folder.** Among these programs and files are the System file, the Finder, and various resources.



## The System file

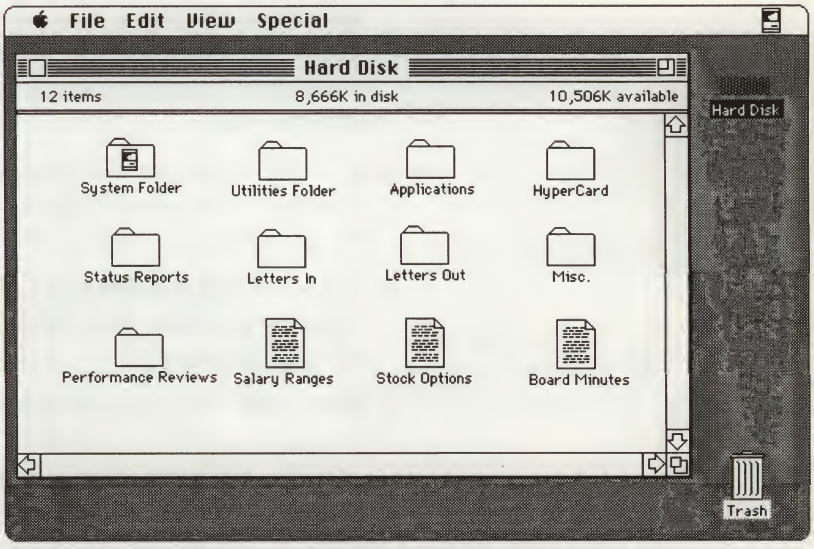
The contents of the **System file** are loaded into RAM automatically when you start up the computer. The System file contains important information that adds to or modifies the operating system routines in ROM:

- Messages that your computer uses to communicate with you need to be in a language you can understand. These messages are contained in the System file rather than in ROM so that the same computer can accommodate users of a wide variety of languages. (That is, the ROM contains no language-specific information. Instead, Apple Computer produces an extensive variety of foreign-language versions of its system software disks.)
- Keyboard layouts vary in international markets. This information is contained in the System file because it's more efficient to adapt a disk for foreign markets than the ROM itself.
- **Fonts** and **desk accessories** are kept in the System file so that you can customize your disks with whatever special fonts and desk accessories you need for your work.
- **Patch code** incorporates minor changes to the routines in ROM. That way, Apple can offer periodic ROM enhancements that you can take advantage of without having to upgrade the ROM chip itself. The routines in patch code are loaded into RAM when you start up the computer; they merely override the routines in ROM that they replace.

**Code** is another term for computer instructions.

## The Finder

The **Finder** is a special program that manages the Macintosh desktop; it is automatically loaded into RAM whenever you start up the computer. If you used the training disk, or the tutorial in the *Macintosh System Software User's Guide,* you've already worked with the Finder.




Along with the mouse, the Finder makes working with disks and their contents simple. Disks and files—usually applications, folders, and documents—are represented graphically in windows. As you've already seen, you use the pointer on the screen and the mouse button to work with icons, windows, and menus. You can perform almost all your disk and file functions just by pointing, clicking, and dragging, rather than by typing out lengthy commands.

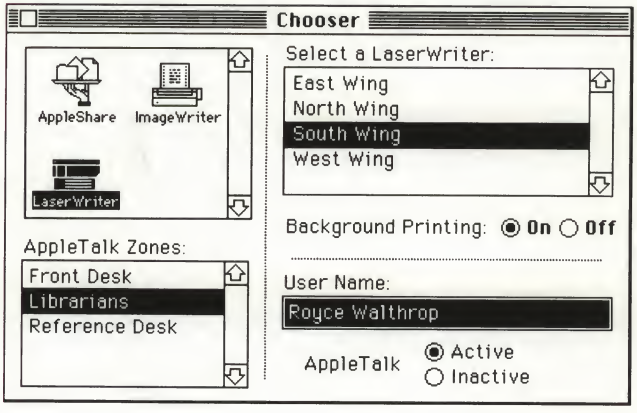
## Resources

Resources are also sometimes referred to as *device drivers*.

For instructions on using the Chooser desk accessory, see the *Macintosh System Software User's Guide*.

**Resources** are files that contain information the microprocessor needs before it can communicate with devices attached to your computer system. For example, before you can print a document on a printer, the computer needs information about the type of printer you're using and how to communicate with it. This information is contained in **printer resources.** Other devices—such as plotters, scanners, file servers, and so on—require their own resources as well.

The resources in your System Folder determine the types of devices you can use with your Macintosh. When you start up the computer, the operating system notes which resources you have in the System Folder, and then lists them in the Chooser desk accessory window. Before you can print a document on a printer, for example, you must first use the Chooser (from the Apple menu) to indicate which printer you want and what port the printer is connected to.



## Startup disks

Because the information in the System Folder is essential to the Macintosh operating system, your computer cannot complete its startup procedure without it. Accordingly, disks that contain a System Folder are called **startup disks.** It's possible to have more than one startup disk in your system's disk drives, but the computer will use only one to start itself up. When you switch on your computer, the operating system searches through the disk drives for a startup disk, and uses the System Folder on the first startup disk it finds to start itself.

### Scanning order

In searching for a startup disk, the operating system scans the available disk drives in a particular order. First it looks in the internal floppy disk drive. If it finds none there, it searches in any external floppy disk drive connected through the disk drive port. Then it looks for SCSI drives. First it checks to see if a device has been selected as a startup device in the Control Panel desk accessory. (See the Macintosh System Software User's Guide for details.) If none is selected, it looks for an internal hard disk, waiting 15 seconds for the hard disk to respond (Hard disks require some time to start up.) If the operating system receives no response after 15 seconds, then it searches for external devices attached through the SCSI port. If it finds none there, the operating system returns to the internal hard disk. If it still receives no response from the hard disk, the operating system waits for the user to insert a floppy disk in a floppy disk drive.

### Current startup disk

The first startup disk the operating system finds becomes the **current startup disk.** If your computer system includes a hard disk, you'll probably find it most efficient to use the hard disk as the computer's startup disk. Occasionally, though, you'll want to use a floppy disk to start your system. That's why the operating system looks in the floppy drives before starting from the hard disk. In effect, the hard disk is the default startup disk: if it doesn't find a disk with a System Folder in any other drive, it uses the hard disk. (You'll learn more about startup disks in the *Macintosh System Software User's Guide.*)

# How it works

The following sections provide a general description of how the hardware and software components of the Macintosh IIx system work together.

## Starting up the computer

When you switch on your Macintosh IIx, the operating system determines how much memory space is present in RAM, performs some system diagnostic tests, and then begins scanning the disk drives for a startup disk.

When it identifies a startup disk, the operating system looks in the disk directory for the location of the System file, directs the disk drive's read/write heads to the appropriate sectors, and loads the essential parts of the System file into RAM.

With the core of the System file in RAM, the operating system now has all the information it needs about your keyboard layout, the messages it needs to communicate with you, the specific fonts and desk accessories installed in the System file, and any enhancements to the ROM routines in the form of patch code.

Once it has loaded the System file into RAM, the operating system goes back to the startup disk and loads the resources it needs to communicate with the printers and other devices attached to the system. Then the operating system goes back again to the startup disk, loads the Finder application into RAM, and presents the Finder desktop on the screen. After presenting an icon for the startup disk, the operating system continues looking in other disk drives, presenting icons on the Finder desktop for any additional disks it finds.

With the Finder loaded into RAM and the Finder desktop presented on the screen—showing icons for each of the disks in the system's drives—the system waits for an instruction from you to tell it what to do next. Normally, the instructions you give the computer are in the form of mouse operations (or sometimes keyboard instructions). For example, you might open a disk's icon by selecting the icon and choosing the Open command from the File menu. Or you may want to move or copy a document by dragging its icon. Each time you move the mouse, the operating system keeps track of the pointer's location on the screen and responds appropriately to your clicking the mouse button. More than likely, you'll want to perform some work using an application.

## Starting up an application

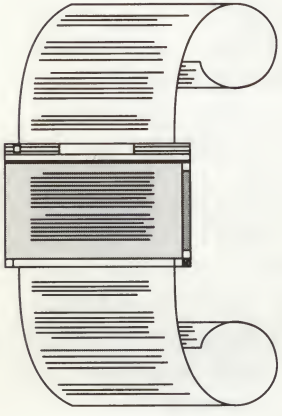
When you start up an application, the operating system goes to the disk directory to find the location of the application's instructions and loads them into RAM.

Depending on the size of the application, the operating system may load only part of the application's code into RAM at one time. While you're using the application, if you try to perform an action that requires parts of the program that are still on the disk, the operating system goes back to the disk and loads the necessary instructions into RAM, sometimes substituting them for code that's already been loaded for previous actions.

## Creating a document from scratch

When you start up an application, most applications present an "Untitled" window, ready for you to begin typing text, drawing pictures, and so on. As you create a document, the operating system assigns specific locations in RAM for all the characters you type on the keyboard (or the art you create with the mouse), and displays what you create on the screen.

Because information in RAM is stored electronically, the document is in a very dynamic state: you can change the contents of the document, move parts from one place to another, delete them entirely, and generally create at your leisure until you've decided on its final form. Meanwhile, the application changes the electronic version of the document in RAM as you go along.



Depending on how much you create, the document you're working on may eventually become too large for you to see all of its contents on the screen at one time. In fact, there's quite a bit more room in RAM for a document than there is room on the screen to display it. As you continue creating, part of the document seems to move beyond the top or side of the screen to make room for the new material you're adding. Actually, the operating system is removing portions of your document from the screen buffer to make room for the new text or graphics.

To see the parts of the document that aren't displayed on the screen, you use the scroll arrows or the scroll bars. As you scroll, the operating system moves the appropriate portions of the document in and out of the screen buffer. This creates the effect of the document being moved under the application's window.

## Saving your work

When you've finished working on a document, you'll probably want a permanent copy of it for safekeeping. To save a document on a disk, you choose the Save command from the File menu. This tells the operating system to create a file on the disk that will contain the document.

Once you give the document a name, and indicate which disk you want the document saved on, the operating system looks in the disk directory for free space in which to store the document. When it finds the space, it moves the disk drive's read/write heads to the available sectors and writes a copy of the electronic version of the document onto the disk's magnetic surface. Then the operating system makes an entry for the document in the disk directory and returns you to the electronic version still in RAM. With a copy of the document safely stored on the disk, you can close the document and free the space in RAM for other work.

## Revising an existing document

You'll often need to return to documents you've already created and stored on a disk. For example, you may need to update your customer lists in a database, change some figures in a spreadsheet budget, or revise a letter or annual report.

When you open a document, the operating system looks first for the application you used to create the document and loads it into RAM. Then it finds the document you're opening, loads a copy of it into RAM, and presents the document on the screen.

Again, the copy of the document in RAM is in its dynamic state. Using the mouse and keyboard, you can make any changes to this version of the document that you want to, and the application changes the electronic version accordingly. Meanwhile, a copy of the original version of the document remains unaltered on the disk.

After you've finished revising the document, you have a choice of two ways to save it on the disk. You can save the revised document with the same name you gave the original; in this case, the operating system replaces the original version with the new one.

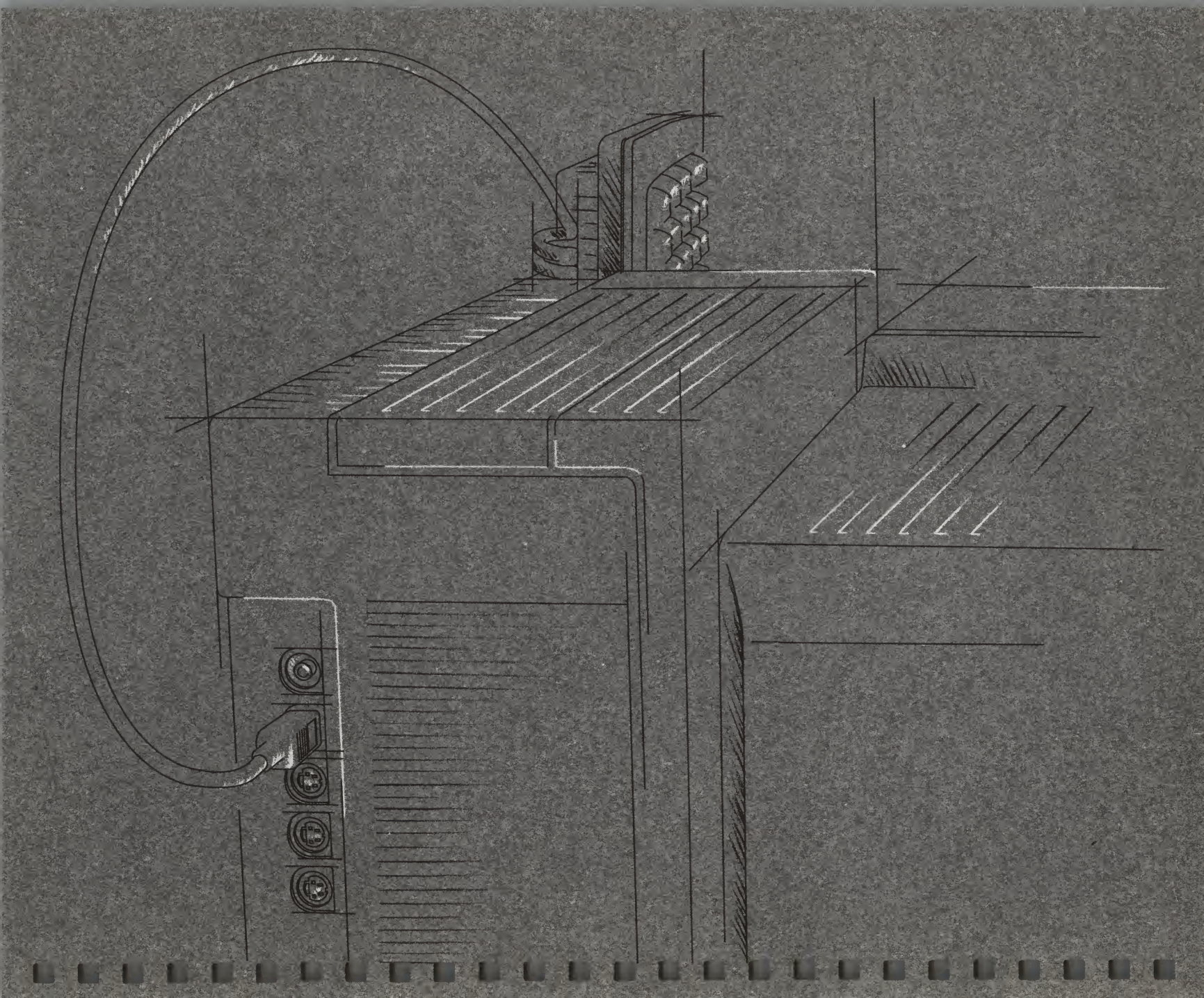
That's fine if you don't want to keep a separate copy of the original document. But you may want to save the revision and keep the original, too. For example, you may have a template document that you want to keep as an original and revise to create personalized versions. In this case, you give the revised document its own name by choosing Save As from the File menu. The operating system then creates a completely new file for the revised version: you have both the original document and the revised document on the disk.

### Quitting an application

After you've saved your documents and are finished working with an application, you quit the application, usually by choosing the Quit command from the application's File menu. This merely directs the operating system to free the space in RAM that was occupied by the application's program code.

## What's next?

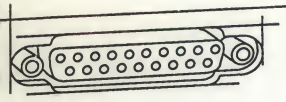
In this chapter, you've only scratched the surface of how your computer works. If you're interested in learning more about the Macintosh IIx, see Appendix D, "Guide to Technical Documentation." It describes other manuals you may want to investigate.

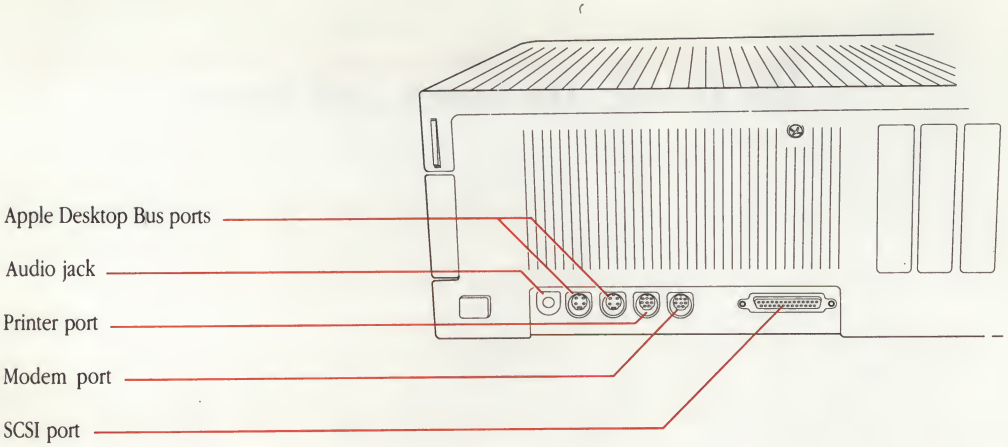


C H A P T E R 4

# Macintosh IIx Buses and Ports

THE MACINTOSH IIX COMPUTER IS DESIGNED TO ACCOMMODATE A VARIETY OF peripheral devices that you can add to your system to customize it for your particular needs. This chapter briefly explains the buses and ports you'll use to attach peripheral devices to your Macintosh IIx computer, and to connect your computer to an AppleTalk® network system.






## The Apple Desktop Bus

A **bus** is a circuit that acts as a common connection for a number of devices.

You connect both the mouse and the keyboard to the computer through the **Apple Desktop Bus** (sometimes abbreviated *ADB*). Though all you normally need to operate the computer are the mouse and keyboard, the Apple Desktop Bus lets you connect a variety of devices concurrently, to customize your system to your particular needs. For instance, you could use a mouse, a keyboard, a track ball, and a graphics tablet all at once. Other devices you might connect to the Apple Desktop Bus ports include specialized keyboards or mouse devices, light pens, bar code readers, and so on.

The Macintosh IIx provides two Apple Desktop Bus ports on its back panel. The Apple Keyboard and Apple Extended Keyboard include additional ports that you can use to daisy-chain devices. All these ports allow greater flexibility in connecting devices: you can attach them directly to the back-panel ports or daisy-chain them through the keyboard.

The number of devices that can be supported by the Apple Desktop Bus varies, depending on the power requirements of each device. Performance will probably deteriorate if more than three devices are daisy-chained to each of the computer's Apple Desktop Bus ports—giving an effective total of six devices.

See the "Apple Desktop Bus Power Requirements" section in Appendix B for more information on how many Apple Desktop Bus devices you should attach at one time.

## NuBus

**Open architecture** refers to the system's ability to use a variety of components designed to meet specialized needs, including video, coprocessing, networking, and so on.

The Macintosh IIx contains six expansion slots, each slot consisting of a 96-pin connector that communicates with the computer's **NuBus** interface. The NuBus interface gives the Macintosh IIx its **open architecture.** It lets you add a variety of components to customize the system to your specific needs—in much the same way as you would assemble components in a stereo system. Expansion cards that use the NuBus interface include

- video cards
- coprocessor cards
- network interface cards
- RAM cards
- peripheral device cards

NuBus cards are self-configuring: each card contains its own **configuration ROM** chip that provides the operating system with the information it needs to communicate with the card. That means you can install a card in any slot without setting switches on the card. When you start up the computer, the operating system determines what cards are in the expansions slots and reads the information in the configuration ROMs automatically. The Control Panel desk accessory displays icons for some types of cards; you choose whatever settings you need to suit your own preferences (such as the colors you want to use with a color video card).

Some expansion cards depend on the 68030 microprocessor for the Macintosh IIx to control their functions, but some are designed to perform independently. That means video and networking cards, for instance, can operate without interrupting the microprocessor's normal execution of program instructions—giving the Macintosh IIx added flexibility and better system performance.

Expansion cards vary in the amount of power they require from the computer's power supply. If you plan to use more than a few cards at a time, you'll need to determine the total power requirements of the cards you install; see the "NuBus Power Requirements" section in Appendix B for more details.

## The modem and printer ports

**Serial communication** means that the eight bits in each byte of data move single-file—*serially*—down one line inside a cable.

You use the **modem** and **printer ports** to attach modems, printers, and other **serial communication** devices to the Macintosh IIx. Because they provide serial communication, these ports are sometimes referred to as the *serial* ports.

The two ports are almost identical; in practical terms, you can attach most serial devices to either port. There are two differences, however:

- The modem port has a higher interrupt priority than the printer port, which means that the microprocessor responds to signals from the modem port first. That's to ensure the constant contact between a modem and the microprocessor necessary for high-speed telecommunication.
- The **AppleTalk** network system is designed to be supported primarily through the printer port. That means if you plan to connect your Macintosh IIx to a **LocalTalk™** network, you'll need to use the printer port.

When you connect a device to either the modem or printer port, you also need to use the Chooser desk accessory from the Apple menu to confirm that choice: this gives the operating system the information it needs to communicate with the device.

## AppleTalk

AppleTalk is Apple's network system for linking Apple computers with other workstations and devices on local and wide area networks. AppleTalk's network architecture is built into the Macintosh IIx. The AppleTalk software is included with the system software on the *Macintosh System Tools* disk.

Different types of cables can be used to link computers and other devices to form an AppleTalk network system. LocalTalk cables are one type; they provide a simple, easily installed, and very low-cost cabling system that lets you link up to 32 computers or devices together to form a local area network. LocalTalk

## The SCSI port

**SCSI** (commonly pronounced "SKUH-zee") is an acronym that stands for *Small Computer System Interface*. SCSI is an industry-standard interface, defined by the American National Standards Institute (ANSI). The SCSI port is a **parallel communication** port that provides very high-speed data access for hard disks, tape backup systems, printers, and other devices. Because it uses an industry-standard interface, you can use many devices (with appropriate software) that would otherwise not be compatible with Apple computers.

**Parallel communication** means that the eight bits in each byte of data move along eight separate *parallel* lines inside a single cable.

The SCSI interface can communicate with up to seven SCSI devices daisy-chained through the SCSI port.

**▲ Warning** Connecting SCSI devices incorrectly can damage your computer. Appendix C, "Connecting SCSI Devices," provides important instructions for connecting SCSI devices to your system. Be sure to read the instructions before connecting any SCSI devices to your computer. ▲

---

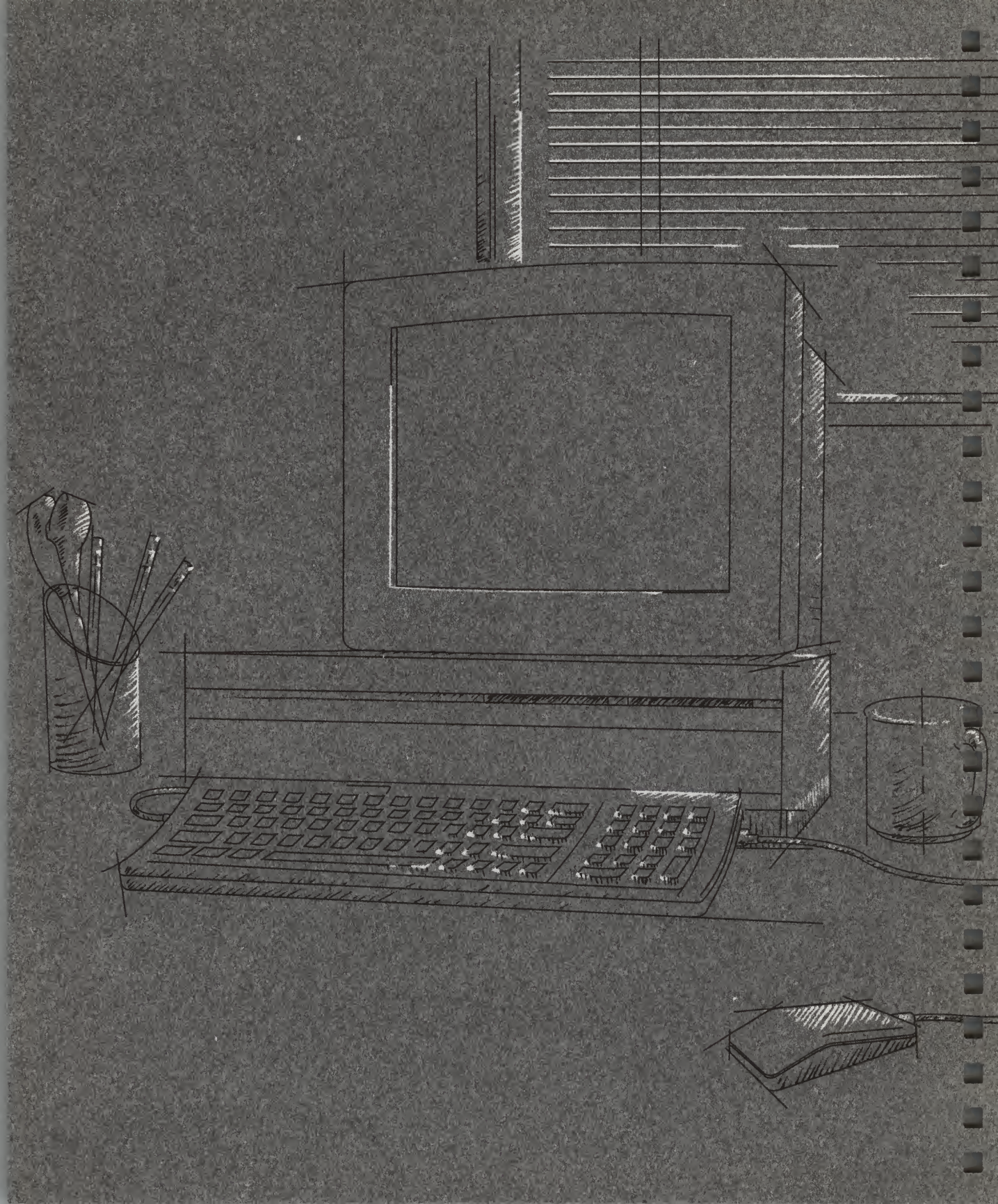
delivers all the benefits of multi-user communication and shared resources, and is the most cost-effective AppleTalk network system.

Another AppleTalk network system is **EtherTalk™**. It is a high-speed alternative that uses the high-performance coaxial cables of an Ethernet network (a communications network widely used in the computer industry), and connects to an EtherTalk Interface Card installed in a NuBus expansion slot in your computer. EtherTalk allows as many as 254 devices to be active on the network at one time, and more than a thousand can be connected to the same Ethernet cable.

For more information about AppleTalk, and the variety of AppleTalk network systems available for the Macintosh IIx, ask your authorized Apple dealer or representative.

## The audio jack

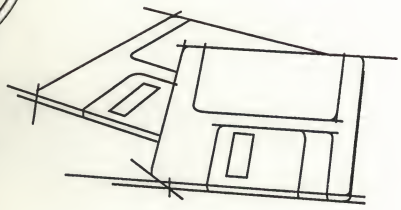
The Macintosh IIx provides a stereo **audio jack** on its back panel that lets you attach a variety of audio accessories—headphones, amplifiers, and other devices. The jack accepts a standard miniature phone plug, the type commonly found on portable cassette headphones.



CHAPTER 5

# Caring for Your Macintosh IIx

THIS CHAPTER PROVIDES INFORMATION ON HOW TO CARE FOR YOUR Macintosh IIx computer. Your computer is sturdy and requires little physical maintenance. But like any piece of electrical equipment, it should not be abused or treated roughly. If you follow the few suggestions here, your computer will work efficiently for a long time.



## The main unit

Give your Macintosh IIx plenty of space—enough so air can circulate on all sides. Make sure air can circulate around each of the ventilation slots on the top and sides of the main unit. The computer has a built-in fan that maintains the operating temperature, but be sure not to block its outlet. You can store your Macintosh IIx on a shelf, but it shouldn't be crammed into a small space while you're using it.

△ **Important** Proper ventilation is important to the life of the computer. Be sure to leave at least a 4-inch to 6-inch clearance between the side vents on the main unit and any object that might restrict air flow. Always keep your computer's main unit flat, sitting on its rubber feet. Standing it on edge defeats the cooling design, and is likely to make your computer overheat. This will eventually damage the main unit. Underwriters Laboratories (UL) and the Canadian Standards Association (CSA) have tested and approved the Macintosh IIx in the horizontal position only. △

The Macintosh IIx can tolerate about the same range of temperatures as you can, but don't let it sit outside in direct sunlight or expose it to rain or moisture. The main unit will normally feel a bit warm to the touch after it's been on for a while.

If you plan to be away from it for eight hours or more, shut off your entire computer system to extend the internal hard disk's life. While the computer part of your system can stay on indefinitely, the disk drive will eventually wear out.

Use common sense when handling your computer. The internal hard disk can be damaged if the computer is dropped or bumped, particularly when the computer is on. If you need to transport the Macintosh IIx any great distance, use the original packing materials.



Follow these suggestions if you need to clean the Macintosh IIx:

- Clean the main unit with a *damp* (not wet) lint-free cloth.
- Don't use aerosol sprays, solvents, or abrasives that might damage the computer's finish.

## The monitor

There are a number of ventilation slots on the top of most monitors. These vents allow heat to escape, so be sure to leave them unobstructed. Don't leave anything—not even a piece of paper—on the top of the monitor's case.

If you choose to leave your computer on all the time, remember to turn down the brightness on the monitor when you're not using it; if your computer is left on for long periods (days or weeks), the image on the screen will start to "burn in," and the screen may be permanently damaged.

If the screen gets dirty, apply a household glass cleaner to a clean cloth or paper towel and wipe the screen. Don't spray glass cleaner directly onto the screen. It could run down inside the case and damage electrical circuits.

## The keyboard

Try not to spill anything on your keyboard. It can be ruined by a spilled soft drink or anything that leaves a sticky residue. Follow these steps if you spill something on the keyboard and it stops working:

- If the liquid is sweet or sticky, unplug the keyboard and take it to your authorized Apple dealer for repair or replacement.
- If the liquid is thin and clear, try unplugging the keyboard, turning it upside down to let the liquid drain out, and drying it for 24 hours at room temperature. If it still doesn't work, take it to your authorized Apple dealer.

# The mouse

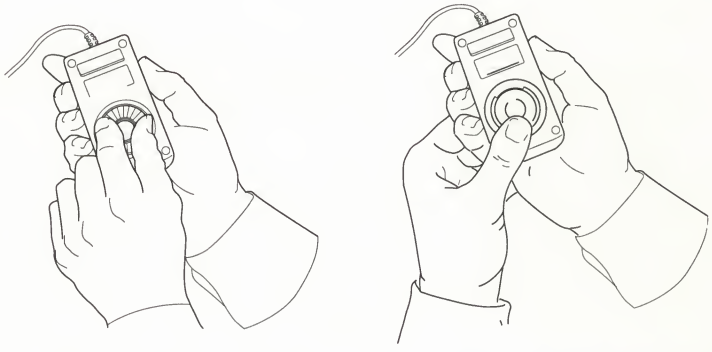
Be careful not to drop the mouse or let it hang from a table by its cable. Use common sense in treating it as carefully as you can.

The surface your mouse moves on should be as smooth, clean, and dust-free as possible. And give the mouse itself an occasional cleaning.

Follow these steps to clean the mouse:

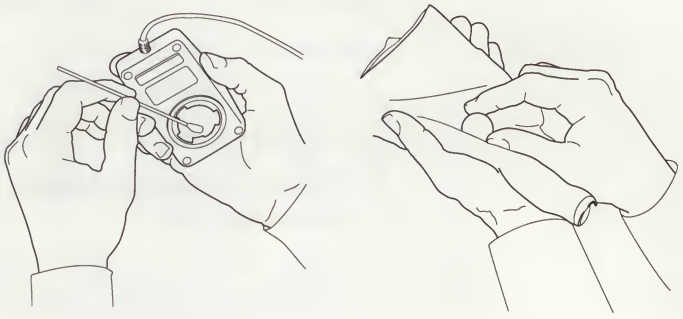
1. **Turn the mouse upside down and open the plastic ring that holds the mouse ball.**

   Apple provides two types of mouse devices with Macintosh computers. The way you open your mouse depends on which type you received. Either rotate the ring counterclockwise as far as it will go (as shown on the left), or pull the ring down so that it snaps toward the bottom end of the mouse (as shown on the right). If one of these methods doesn't work, the other will.



2. **If you have the mouse on the left, hold one hand over the ball and ring to catch them, and turn the mouse back right side up. If you have the mouse on the right, lift the ring off the mouse, hold one hand over the ball, and turn the mouse right side up.**
3. **Inside the case are three rollers, similar to those on a tape recorder. Using a cotton swab moistened with alcohol or tape head cleaner, gently wipe off any oil or dust that has collected on the rollers, rotating them to reach all surfaces.**

4. **Wipe the ball with a soft, clean, dry cloth. (Don't use tissue or anything that may leave lint, and don't use a cleaning liquid.)**



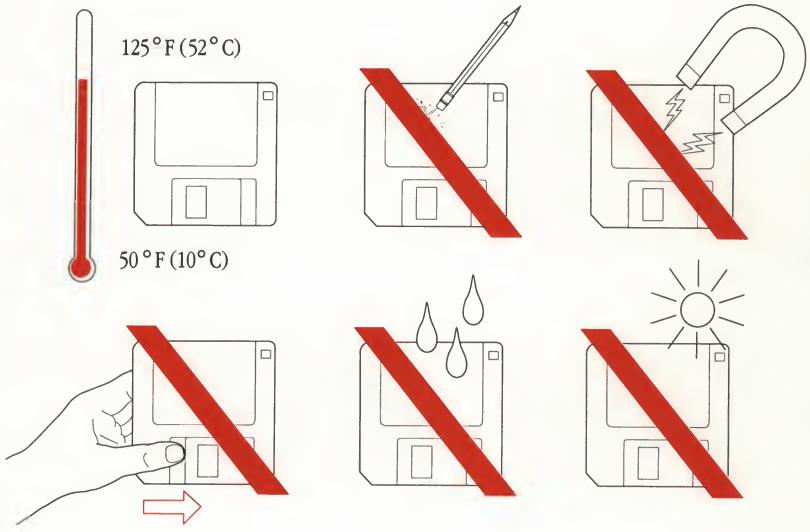
5. **Blow gently into the case to remove any dust that has collected there.**
6. **Put the ball back into its socket. Replace and lock the ring.**

## 3.5-inch disks

Although Apple 3.5-inch disks are quite tough, they do have a few modest physical requirements—about the same as audio cassette tapes have. Keep your Macintosh disks dry and away from extreme temperatures. (Don't put them on top of your Macintosh IIx or your monitor, or store them on the seat of your car.) Keep them out of direct sunlight and out of reach of anything that contains a magnet, such as a telephone. (Magnetic fields can scramble the information on the disk.)

When the disk is inserted into a disk drive, the metal covering on the disk case slides to the left so the Macintosh IIx can get information from and save information on the disk. When the disk is out of the disk drive, the metal covering closes by spring action to protect the disk underneath it. Never touch the exposed disk under the metal covering.

Other than that, you don't have to treat disks especially carefully. You can carry them around in your briefcase or coat pocket or even send them through the mail. (Two fit nicely in a business envelope.)




Be sure to make a backup copy of any disk you can't do without. (See the *Macintosh System Software User's Guide* for instructions on copying disks.)

You can purchase disks in packages of ten from your authorized Apple dealer.

## The clock battery

Your Macintosh IIx has a clock that runs continuously, even when the computer is switched off. (You can set the clock by choosing either Alarm Clock or Control Panel from the Apple menu.) When the computer's power is off, the clock runs on an internal lithium battery with a life expectancy of several years. If the clock begins to lose accuracy, see your authorized Apple dealer or representative for a battery replacement.

## Service and support

To help you get the best performance from your system, Apple Computer, Inc. has established a worldwide network of full-support authorized Apple dealers. If you need answers to technical questions or information about product updates, your authorized Apple dealer can help you. Apple's Technical Support organization backs each dealer and international technical support group via AppleLink®, a state-of-the-art on-line electronic information service, to ensure prompt, reliable assistance.

Your dealer has the latest information on new hardware and software products as well as product updates. If you wish to upgrade your system, your dealer can help you select compatible components.

If your product requires service, your local authorized Apple dealer is trained and ready to support you. Apple provides factory-quality parts and the latest available diagnostic equipment to the more than three thousand authorized Apple service centers throughout the world. Apple guarantees parts and warranty labor. (Regulations in each country determine the length of warranty. Some restrictions may apply, depending on the country of original purchase.)

If for some reason you cannot return to the authorized dealer from whom you purchased your system, go to the nearest service location. For the location nearest you, in the United States, call (800) 538-9696; in Canada, call (800) 268-7796 or (800) 268-7637. For locations in other countries, either call the Apple headquarters in your country or write to

Apple Computer, Inc.
Attn: Customer Relations
20525 Mariani Avenue
Cupertino, CA 95014
USA

or

Apple Canada, Inc.
7495 Birchmount Road
Markham, Ontario
L3R 5G2
Canada

Apple also offers service options designed to meet your needs. One of these is the Apple*Care*® Service Agreement (available in the United States, Canada, and Australia only), which extends full warranty coverage up to three years. Your Apple*Care* contract will be honored at any participating authorized Apple dealer within the country of purchase—an added benefit if you relocate. Local service means time saved in getting your Apple system back to work.

You can purchase Apple*Care* at any time, but it's a good idea to purchase it with your system, or at least before your warranty has expired, to avoid an owner-paid inspection.

There are also self-service plans designed to allow large installations to repair their own equipment. Whether you use your computer at home, in the office, or at school, Apple has a low-cost service plan for you. For details, please see your authorized Apple dealer.

APPENDIX A

# The Macintosh Product Line

THIS APPENDIX SUMMARIZES THE DIFFERENCES BETWEEN THE VARIOUS MODELS OF Macintosh computers. It is provided primarily for users who may be familiar with earlier models and who need a quick reference to the added features of newer Macintosh systems. The chart focuses primarily on hardware features; for a historical summary of the different versions of Macintosh system software, see the *Macintosh System Software User's Guide*.

| | ■ Macintosh (128K) | ■ Macintosh 512K | ■ Macintosh 512K Enhanced |
|---|---|---|---|
| **Processor** | MC68000 CPU | MC68000 CPU | MC68000 CPU |
| **Clock frequency** | 7.8336 MHz | 7.8336 MHz | 7.8336 MHz |
| **Addressing** | 32-bit internal registers<br>24-bit address bus | 32-bit internal registers<br>24-bit address bus | 32-bit internal registers<br>24-bit address bus |
| **Coprocessor** | None | None | None |
| **ROM** | 64 KB | 64 KB | 128 KB |
| **RAM** | 128 KB | 512 KB | 512 KB |
| **Hardware memory management** | None | None | None |
| **Slot expansion** | None | None | None |
| **Sound** | RAM-based sound buffer<br>Monophonic (Miniature phone plug) | RAM-based sound buffer<br>Monophonic (Miniature phone plug) | RAM-based sound buffer<br>Monophonic (Miniature phone plug) |
| **Internal 3.5-inch disk drive** | 400K | 400K | 800K |
| **External 3.5-inch disk drive** | 400K | 400K | 400K or 800K |
| **Hard disk** | None | Optional external Hard Disk 20 | Optional external Hard Disk 20 |
| **SCSI** | None | None | None |
| **Serial ports** | Two serial ports (DB-9) | Two serial ports (DB-9) | Two serial ports (DB-9) |
| **Video display** | Built-in 9-inch diagonal, 512-by-342 pixel, black-and-white monitor | Built-in 9-inch diagonal, 512-by-342 pixel, black-and-white monitor | Built-in 9-inch diagonal, 512-by-342 pixel, black-and-white monitor |
| **Keyboard** | Macintosh keyboard (RJ-11) | Macintosh keyboard (RJ-11) | Macintosh keyboard (RJ-11) |
| **Mouse** | Macintosh Mouse connected through mouse port (DB-9) | Macintosh Mouse connected through mouse port (DB-9) | Macintosh Mouse connected through mouse port (DB-9) |

| | Macintosh Plus | Macintosh SE |
|---|---|---|
| **Processor** | MC68000 CPU | MC68000 CPU |
| **Clock frequency** | 7.8336 MHz | 7.8336 MHz |
| **Addressing** | 32-bit internal registers<br>24-bit address bus | 32-bit internal registers<br>24-bit address bus |
| **Coprocessor** | None | None built in. Accepts optional coprocessor card installed in internal SE Bus expansion connector. |
| **ROM** | 128 KB | 256 KB |
| **RAM** | 1 MB expandable to 4 MB | 1 MB expandable to 4 MB |
| **Hardware memory management** | None | None |
| **Slot expansion** | None | SE Bus expansion connector |
| **Sound** | RAM-based sound buffer<br>Monophonic (Miniature phone plug) | RAM-based sound buffer<br>Monophonic (Miniature phone plug) |
| **Internal 3.5-inch disk drive** | 800K | 800K<br>Optional second 800K |
| **External 3.5-inch disk drive** | 400K or 800K | 400K or 800K |
| **Hard disk** | Optional external Hard Disk 20<br>Optional external SCSI hard disks | Optional external Hard Disk 20<br>Optional SCSI hard disks (internal/external) |
| **SCSI** | SCSI port (DB-25) | SCSI port (DB-25) |
| **Serial ports** | Two serial ports (Mini-8) | Two serial ports (Mini-8) |
| **Video display** | Built-in 9-inch diagonal, 512-by-342 pixel, black-and-white monochrome monitor | Built-in 9-inch diagonal, 512-by-342 pixel, black-and-white monochrome monitor.<br>Accepts optional external monitor connected through video card in SE Bus expansion connector. |
| **Keyboard** | Macintosh Plus keyboard—includes numeric keypad (RJ-11) | Apple Keyboard or Apple Extended Keyboard connected through Apple Desktop Bus ports (Mini-4) |
| **Mouse** | Macintosh Mouse connected through mouse port (DB-9) | Apple Desktop Bus Mouse (Mini-4) |

| | Macintosh II | Macintosh IIx |
|---|---|---|
| **Processor** | MC68020 CPU | MC68030 CPU |
| **Clock frequency** | 15.6672 MHz | 15.6672 MHz |
| **Addressing** | 32-bit internal registers<br>32-bit address bus | 32-bit internal registers<br>32-bit address bus |
| **Coprocessor** | Built-in MC68881 Floating-Point Unit (FPU).<br>Accepts optional coprocessor cards installed in NuBus expansion slots. | Built-in MC68882 Floating-Point Unit (FPU).<br>Accepts optional coprocessor cards installed in NuBus expansion slots. |
| **ROM** | 256 KB | 256 KB |
| **RAM** | 1 MB expandable to 8 MB (expandable to 128 MB when SIMMs with higher-density DRAM chips become available; additional expandability through NuBus slots) | 4 MB expandable to 8 MB (expandable to 128 MB when SIMMs with higher-density DRAM chips become available; additional expandability through NuBus slots) |
| **Hardware memory management** | Built-in 24/32-bit Address Mapping Unit (AMU) for address translation.<br>Optional MC68851 Paged Memory Management Unit (PMMU). | 24/32-bit address translation and paged memory management supported by the MC68030 CPU |
| **Slot expansion** | Six NuBus expansion slots | Six NuBus expansion slots |
| **Sound** | Apple Sound Chip (ASC)<br>Stereophonic (Miniature phone plug) | Apple Sound Chip (ASC)<br>Stereophonic (Miniature phone plug) |
| **Internal 3.5-inch disk drive** | 800K<br>Optional second 800K | 1.4-MB high-density<br>Optional second 1.4 MB |
| **External 3.5-inch disk drive** | Not supported | Not supported |
| **Hard disk** | Optional SCSI hard disks (internal/external) | SCSI hard disks (internal/external) |
| **SCSI** | SCSI port (DB-25) | SCSI port (DB-25) |
| **Serial ports** | Two serial ports (Mini-8) | Two serial ports (Mini-8) |
| **Video display** | Supports multiple external color and monochrome monitors connected through video cards in NuBus expansion slots. | Supports multiple external color and monochrome monitors connected through video cards in NuBus expansion slots. |
| **Keyboard** | Apple Keyboard or Apple Extended Keyboard connected through Apple Desktop Bus ports (Mini-4) | Apple Keyboard or Apple Extended Keyboard connected through Apple Desktop Bus ports (Mini-4) |
| **Mouse** | Apple Desktop Bus Mouse (Mini-4) | Apple Desktop Bus Mouse (Mini-4) |

A P P E N D I X B

# Technical Information

THIS APPENDIX PROVIDES TECHNICAL INFORMATION ABOUT YOUR Macintosh IIx computer. If you don't find the information you need, refer to Appendix D, "Guide to Technical Documentation." There you'll find a thorough discussion of the technical documentation available for Macintosh computers.

Here's a list of the sections you'll find in this appendix:

- specifications
- programmer's switch
- Apple Desktop Bus power requirements
- NuBus power requirements
- SIMM configurations
- pin assignments
- Macintosh peripheral cables

## Specifications

| | |
|---|---|
| Processor: | MC68030, 32-bit architecture<br>15.6672 MHz clock frequency<br>(supports paged memory management) |
| Coprocessors: | MC68882 Floating-Point Unit (follows IEEE standards) |
| Memory: | 4 MB expandable to 8 MB (expandable to 128 MB when SIMMs with higher-density DRAM chips become available; additional expandability through NuBus slots) |
| | 256 KB ROM |
| | 256 bytes of user-settable parameter memory |
| Disk capacity: | 800 KB on double-sided 3.5-inch (floppy) disks |
| | 1.4-MB on high-density, double-sided 3.5-inch (floppy) disks (second unit optional) |
| | Internal Apple SCSI hard disk. Optional stand-alone SCSI hard disks. |
| Interfaces: | Two Apple Desktop Bus connectors for communication with keyboard, mouse, and other devices over low-speed, synchronous serial bus |
| | Six internal NuBus expansion slots supporting full 32-bit address and data lines |
| | Two RS-232/RS-422 serial ports, 230.4K baud maximum (up to 0.920 Mbit per second if clocked externally) |
| | SCSI interface |
| | Sound port for external audio amplifier |

| | |
|---|---|
| Sound generator: | Apple Sound Chip (ASC) including 4-voice wave-table synthesis and stereo sampling generator capable of driving stereo mini phone jack headphones or stereo equipment |
| Input: | Line voltage: 120/240 volts AC, RMS automatically configured |
| | Frequency: 48–62 Hz single phase |
| | Power: 230 watts maximum, not including monitor power |
| Clock/calendar: | CMOS custom chip with long-life lithium battery |
| Keyboards: | Apple Keyboard<br>Apple Extended Keyboard |
| Mouse: | Apple Desktop Bus Mouse<br>Mechanical tracking, optical shaft or contact encoding 3.94 ± .39 pulses per mm (100 ± 10 pulses per inch) of travel |
| Monitors: | Options include 12-inch, 640-by-480–pixel monochrome; 13-inch, 640-by-480–pixel RGB |

## Environment

| | |
|---|---|
| Operating temperature: | 10° C to 35° C<br>50° F to 95° F |
| Storage temperature: | -40° C to 47° C<br>-40° F to 116.6° F |
| Relative humidity: | 5% to 95%<br>(noncondensing) |
| Altitude: | 0 to 3048 m (0 to 10,000 ft.) |

### Size and weight

| | Weight | Height | Width | Depth |
|---|---|---|---|---|
| Main unit | 11.8 kg*<br>26 lbs* | 140 mm<br>5.5 in | 474 mm<br>18.7 in | 365 mm<br>14.4 in |
| Apple Keyboard | 1.0 kg<br>2 lbs 2 oz | 44.5 mm<br>1.8 in | 418.3 mm<br>16.5 in | 142.0 mm<br>5.6 in |
| Apple Extended Keyboard | 1.6 kg<br>3 lbs 10 oz | 56.4 mm<br>2.3 in | 486 mm<br>19.1 in | 188 mm<br>7.4 in |
| Mouse | .17 kg<br>6 oz | 27.9 mm<br>1.1 in | 53.3 mm<br>2.1 in | 96.5 mm<br>3.8 in |
| Apple High-Resolution Monochrome Monitor | 7.7 kg<br>17 lbs | 255 mm<br>10.0 in | 310 mm<br>12.2 in | 373 mm<br>14.7 in |
| Apple High-Resolution RGB Color Monitor | 15.45 kg<br>34 lbs | 281 mm<br>11.1 in | 344 mm<br>13.5 in | 402 mm<br>15.8 in |

* Weight varies depending on installed optional second 3.5-inch drive.

## Programmer's switch

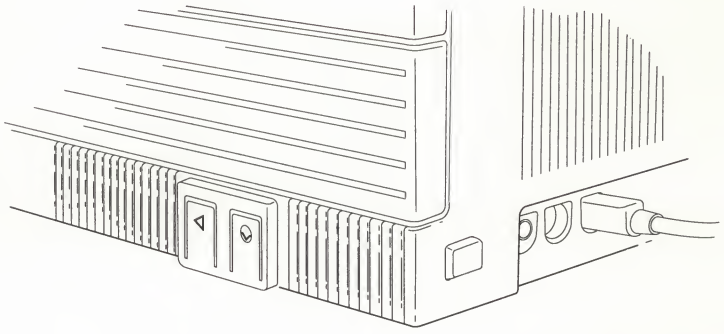
The programmer's switch is for people who want to write application programs for the Macintosh IIx. If you aren't an applications developer, just ignore the switch. Installing it and using it in the wrong way could cause you to lose information.

If you are an applications developer, install the programmer's switch only if you're developing stand-alone applications or desk accessories. The switch has two parts. The front part of the switch is a reset switch. Pressing it is just like turning the power switch off and back on, and carries the same cautions—press it only in the Finder with all disks properly ejected. The back part of the switch is an interrupt switch; press it only if you have debugging software installed.

The switch snaps into place on the right side of the Macintosh IIx.

Follow these steps to install the switch:

1. **Align the switch so that the rightmost pin on the switch fits in the last air vent on the right side of the main unit.**
2. **Tip the switch and insert the top pair of pins with the hooks facing up.**
3. **Push up and in on the bottom of the switch. The switch should snap into place.**



## Apple Desktop Bus power requirements

Although the Apple Desktop Bus can address up to 16 devices, performance will probably deteriorate if more than three devices are daisy-chained to each of the computer's Apple Desktop Bus ports (giving an effective total of six devices). Apple Desktop Bus devices may use the +5 volt power supplied by the bus, but must not draw more than 500 mA total for all devices. The mouse draws an average of 80 mA. The power needed by the keyboard varies, depending on which type of keyboard you have attached to your system:

| | |
|---|---|
| Apple Keyboard | 80 mA |
| Apple Extended Keyboard | 25 mA |

All devices are connected in parallel using the signal, power, and ground wires. Total cable length should be no longer than 5 meters, and cable capacitance should not exceed 100 picofarads per meter.

**▲ Warning** Do not connect or add a device to the Apple Desktop Bus while the system is on. Connecting any device while the system is on will reset the addresses for all devices on the bus. ▲

## NuBus power requirements

There are limits to the amount of power available for the six NuBus expansion slots in the main unit of the Macintosh IIx. Under most circumstances, this should not create a problem. However, if you plan to install several cards, you should check the total power requirements for all cards combined and make sure that the total does not exceed recommended limits. Installing a group of cards that make excessive demands on available power may cause damage to one or more cards, or to the computer itself.

A NuBus expansion card can draw three types of current from a NuBus expansion slot:

- +5 volt current
- +12 volt current
- –12 volt current

Each card will normally draw power from these currents in varying combinations and in varying amounts. First determine the power requirements for each of your cards, and then add those numbers together and verify that the *totals* do not exceed the recommended limits. The following table defines those limits:

| Type of current | Recommended totals |
|---|---|
| +5 volt | 12.8 amps |
| +12 volt | 1.3 amps |
| –12 volt | 1.0 amp |

Use the specifications that came with the cards to calculate total power requirements. (They're usually listed in a manual or specifications sheet, or on the product package.)

## SIMM configurations

RAM in the Macintosh IIx is provided in four or eight packages called single in-line memory modules, or SIMMs. (Memory can also be added on cards installed in NuBus expansion slots.) Each SIMM contains surface-mounted dynamic RAM (DRAM) chips on a single circuit board, with electrical "finger" contacts along one edge that plug into the SIMM sockets mounted on the computer's logic board. SIMMs can contain RAM chips with densities of either 256 Kbits or 1 Mbit. (SIMMs with higher-density chips can be used when available.)

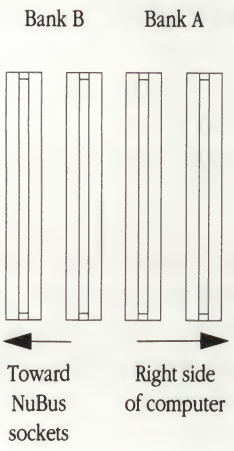
**▲ Warning** Be sure your computer is plugged in but turned *off* and has had time to cool down before you do any work inside the main unit. Touch the power supply case to discharge any static electricity from your clothes or body before handling components inside the Macintosh IIx. ▲

Your Macintosh IIx may have one of several RAM configurations, depending on how many SIMMs are used, the density of the RAM chips that are mounted on the SIMMs, and whether your system was upgraded. They are

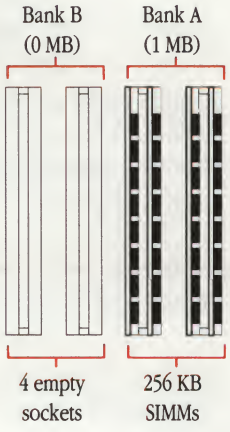
- 1 MB (before upgrading)
- 2 MB (before upgrading)
- 4 MB (standard configuration)
- 5 MB
- 8 MB

Macintosh IIx SIMMs are arranged in two memory banks (bank A and bank B); each bank consists of four SIMM sockets. Each SIMM socket holds one SIMM card. A minimum of four SIMMs with the same density DRAM chips must be used. SIMMs of different densities may be combined; however, they must be in groups of four. Some configurations—such as mixing RAM chips of different densities in a bank of SIMMs, or using fewer than four SIMMs in a bank—are not allowed. If RAM chips of different densities are used, their placement in the SIMM banks is critical. Use the diagrams on the facing page for proper installation.

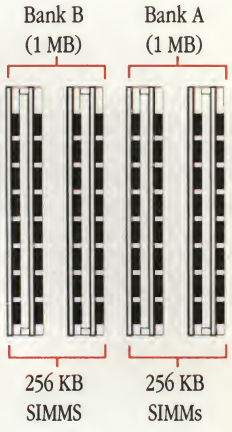
△ **Important** On your system, the number of DRAM chips on each RAM SIMM may be more or less than those shown here. △



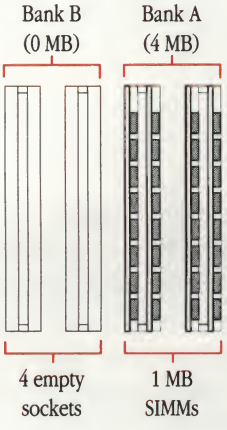

**1 MB**



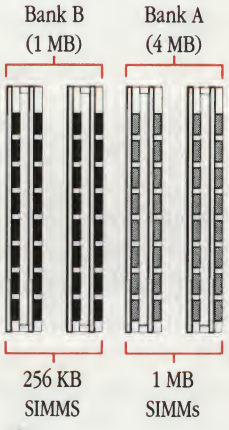

**2 MB**



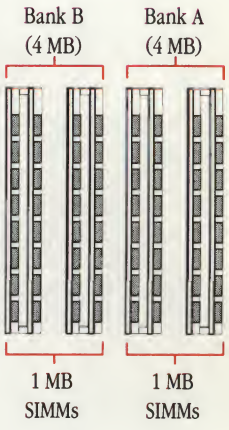

**4 MB**




**5 MB**




**8 MB**




▲ **Warning** The Macintosh IIx ROM is installed next to Bank B in its own SIMM socket. Do not remove the ROM SIMM unless you are replacing the ROM unit. ▲

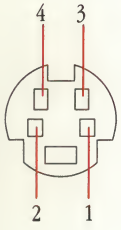
△ **Important** Macintosh IIx SIMMs should be 120 nS RAM-access time or faster. Installing the slower 150 nS SIMMs available for other models of Macintosh computers is not recommended. △

## Pin assignments

This section presents the pin assignments and functions for all the external connectors on the back panel of the Macintosh IIx.

△ **Important** The connector type listed for each port indicates the correct *plug* to use with the port illustrated in the margin. △

### Apple Desktop Bus port

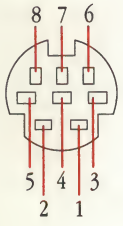



| Pin number | Signal name | Signal description |
|---|---|---|
| 1 | ADB | Data |
| 2 | PWRON | Power on |
| 3 | +5v | +5 volts DC |
| 4 | GND | Signal ground |

Connector type: Mini-4

Total length of all cables not to exceed 16 feet (5 meters).

### Modem and printer ports

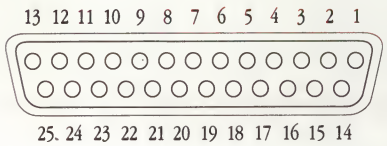



| Pin number | Signal name | Signal description |
|---|---|---|
| 1 | HSKo | Handshake out |
| 2 | HSKi | Handshake in/external clock |
| 3 | TXD– | Transmit data – |
| 4 | GND | Signal ground |
| 5 | RXD– | Receive data – |
| 6 | TXD+ | Transmit data + |
| 7 | GPi | General purpose input* |
| 8 | RXD+ | Receive data + |

Connector type: Mini-8

*Modem port only: Can be set in software to be a second external clock.

## SCSI port




| Pin number | Signal name | Signal description |
|---|---|---|
| 1 | REQ/ | Request |
| 2 | MSG/ | Message |
| 3 | I/O/ | Input/Output |
| 4 | RST/ | SCSI bus reset |
| 5 | ACK/ | Acknowledge |
| 6 | BSY/ | Busy |
| 7 | GND | Signal ground |
| 8 | DB0/ | Data bit 0 |
| 9 | GND | Signal ground |
| 10 | DB3/ | Data bit 3 |
| 11 | DB5/ | Data bit 5 |
| 12 | DB6/ | Data bit 6 |
| 13 | DB7/ | Data bit 7 |
| 14 | GND | Signal ground |
| 15 | C/D/ | Command/Data |
| 16 | GND | Signal ground |
| 17 | ATN/ | Attention |
| 18 | GND | Signal ground |
| 19 | SEL/ | Select |
| 20 | DBP/ | Data parity |
| 21 | DB1/ | Data bit 1 |
| 22 | DB2/ | Data bit 2 |
| 23 | DB4/ | Data bit 4 |
| 24 | GND | Signal ground |
| 25 | TPWR | Terminator power |

Connector type: DB-25

Total length of all cables not to exceed 20 feet (6 meters).

**▲ Warning** This port uses the same type of connector as a standard RS-232, DB-25 serial interface, but is electrically very different. Do not connect any RS-232 device to this connector. Doing so can result in damage to both the device and the Macintosh IIx. ▲

## Audio jack



| Pin number | Signal name | Signal description |
|---|---|---|
| (Sleeve) | GND | Signal ground |
| (Ring) | RIGHT | 1.5 volt peak-to-peak audio signal, right channel |
| (Tip) | LEFT | 1.5 volt peak-to-peak audio signal, left channel |

Connector type: Stereo miniature phone plug

The internal speaker is disabled when this port is in use.

# Macintosh peripheral cables

This table is a guide to the cables you should use with your Macintosh IIx and peripheral devices.

| | | |
|---|---|---|
| **Storage devices** | Apple Hard Disk 20SC and other SCSI hard disks (DB-25) | M0206 Apple SCSI System Cable |
| | AppleCD SC™ compact disk (DB-25) | M0206 Apple SCSI System Cable |
| | Apple SCSI Tape Backup (DB-25) | M0206 Apple SCSI System Cable |
| **Modems** | Apple Personal Modem (Mini-8) | M0197 Apple System/ Peripheral-8 Cable |
| | Apple Modem 300/1200 (DB-9) | M0199 Macintosh Plus Peripheral Adapter (use with existing cable) |
| | AppleFax™ Modem (Mini-8) | M0197 Apple System/ Peripheral-8 Cable |

| | | |
|---|---|---|
| **ImageWriter printers** | ImageWriter®<br>(DB-25) | M0199<br>Macintosh Plus<br>Peripheral Adapter<br>(use with existing cable) |
| | ImageWriter II<br>(Mini-8) | M0197<br>Apple System/<br>Peripheral-8 Cable |
| | ImageWriter LQ<br>(Mini-8) | M0197<br>Apple System/<br>Peripheral-8 Cable |
| | AppleTalk ImageWriter II<br>(Mini-8) | M2068<br>LocalTalk Locking<br>Connector Kit DIN-8 |
| **LaserWriter printers** | LaserWriter®<br>(DB-9) | M2065<br>LocalTalk Locking<br>Connector Kit DB-9 |
| | LaserWriter Plus<br>(DB-9) | M2065<br>LocalTalk Locking<br>Connector Kit DB-9 |
| | LaserWriter IINT<br>(Mini-8) | M2068<br>LocalTalk Locking<br>Connector Kit DIN-8 |
| | LaserWriter IINTX<br>(Mini-8) | M2068<br>LocalTalk Locking<br>Connector Kit DIN-8 |
| | LaserWriter IISC<br>(DB-25) | M0206<br>Apple SCSI System Cable |
| **Scanner** | Apple Scanner<br>(DB-25) | M0206<br>Apple SCSI System Cable |

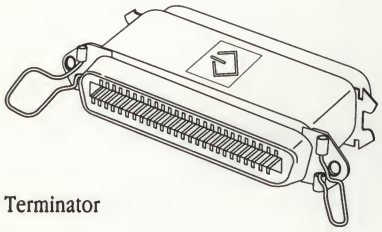
△ **Important** The Macintosh IIx was FCC-certified under test conditions that included the use of shielded cables and connectors between system components. It is important that you use shielded cables and connectors to reduce the possibility of causing interference to radio, television, and other electronic devices. △

A P P E N D I X C

# Connecting SCSI Devices

THIS APPENDIX PROVIDES INFORMATION YOU'LL NEED TO CONNECT SCSI DEVICES to your Macintosh IIx computer. You'll find instructions for assembling a SCSI chain and including the correct number of terminators. You'll also find instructions on setting the SCSI ID numbers on the devices you connect to your computer.

## SCSI cables and terminators



Terminator

Devices connected to the SCSI port on the back of the main unit must have the proper number of **terminators** for the devices to work correctly and to prevent damage to the SCSI chip inside your computer.

Apple SCSI Cable Terminators are hardware devices that attach to a SCSI device or SCSI cable. There must be no more than two terminators in a SCSI chain—one at the start of the chain and one at the end.

Knowing when you do and don't need a terminator can be confusing. Sometimes a terminator is inside a SCSI device where you can't see it, as with your internal hard disk. (The manual for the device should tell you whether it has a terminator.) Find the situation that applies to you in one of the following sections. In all cases, it's assumed that you're using Apple's 18-inch SCSI System Cable from your computer to the first SCSI device.

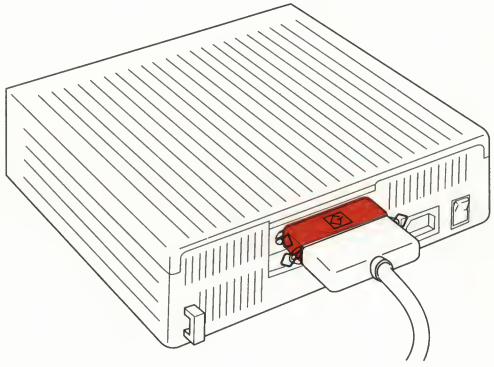
**▲ Warning** You can have no more than two terminators in the entire SCSI chain. More than two terminators in the chain may damage your computer. Check the manual that came with the device to be sure.

Never connect an RS-232 device to the SCSI port. Even though the SCSI port looks like an RS-232 connector, it is not a serial port or parallel printer interface. Attaching anything other than a SCSI device to the SCSI port can damage your computer.

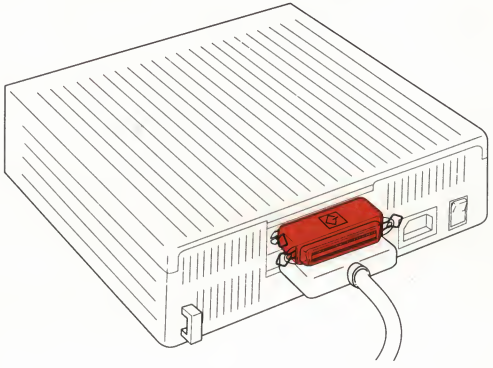
If you're not sure what type of device you have, or whether it's OK to plug it in, contact your authorized Apple dealer or representative. ▲

Terminators are used in one of two ways in a SCSI chain. A terminator is either added between the SCSI System Cable and a SCSI connector, or added to the last available port on the SCSI device. Use the following diagrams in setting up your own SCSI chain. (Red indicates terminators or devices that contain internal terminators.)

- Terminator added between SCSI System Cable and SCSI connector

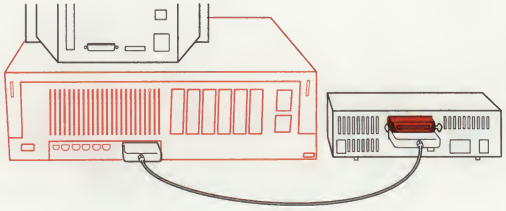


- Terminator added to last available port



## Connecting a single device

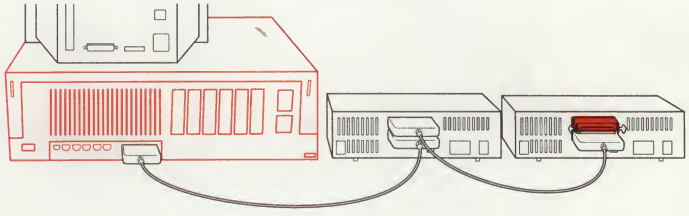
- If you are connecting an Apple device, or another device that does not contain a terminator, add a terminator to the last available port on the device.



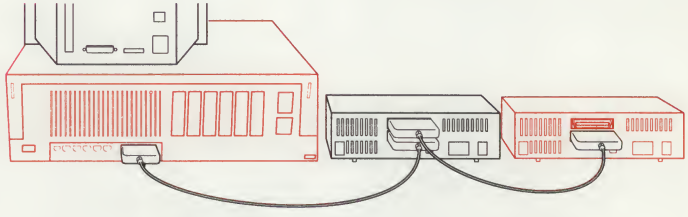
- If the device already contains a terminator, do not add one.

## Connecting multiple devices

- If you are connecting only Apple devices, or other devices that do not contain terminators, add a terminator to the last available port on the last device in the chain.



- If one of the devices in the chain contains a terminator, move that device to the end of the chain and don't add any terminators.



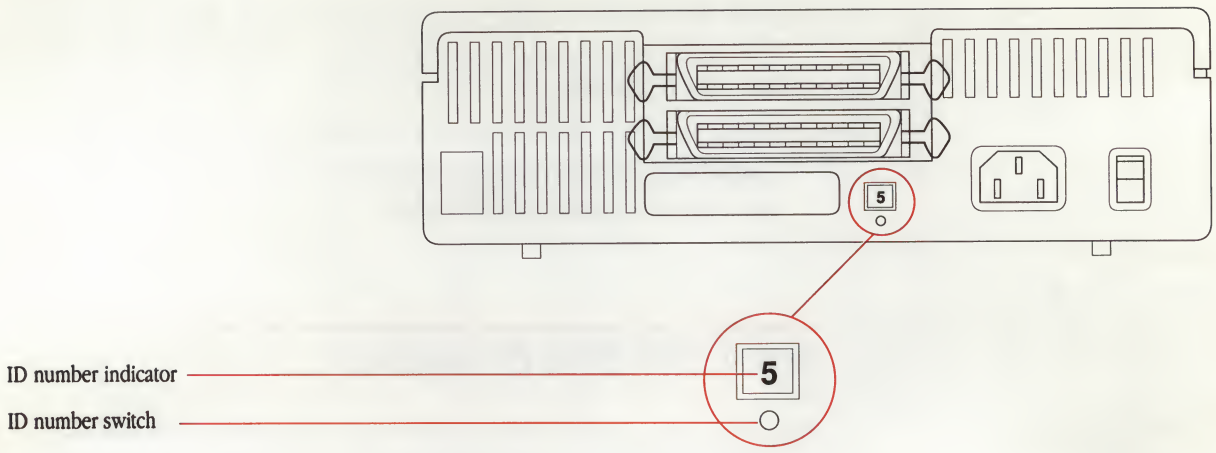
- If two of the devices in the chain contain a terminator, place one device at the end of the chain and remove the terminator from the other device, or have your dealer remove it.
- If more than two devices contain terminators, remove the terminators from all but one of the devices, or have your dealer remove them. Then place that device at the end of the chain.

## Setting the SCSI ID numbers

Before you begin using the SCSI devices connected to your computer, you may need to set the SCSI ID number on each device. The computer uses the SCSI ID number to communicate correctly with the devices connected to it. Each device must have its own ID number. It identifies the device and assigns priorities on the SCSI chain; devices with higher ID numbers have higher priority in communicating with the computer. Generally, you assign the higher ID numbers to devices you use most often.

Eight numbers—7 through 0—are used to distinguish SCSI devices on the chain. The Macintosh itself is always assigned ID #7; you don't need to set the computer's ID number. The internal hard disk is set to ID #0. (You can override the normal sequence by using the Control Panel desk accessory to select a preferred startup device.)

Apple SCSI peripheral devices are shipped with assigned SCSI ID numbers. The SCSI ID switch shows the ID number on the back panel of the device. If you don't have more than one of the same type of Apple SCSI device, you shouldn't need to set any ID numbers.




If you need to assign a different SCSI ID number to a device, follow these steps:

1. **Make sure the device is turned off.**
2. **Choose an unassigned SCSI ID number.**
3. **Insert the point of a push pin or straightened paper clip into the SCSI ID number switch.**
4. **Push gently.**

   The number increases.
5. **If you go past the number you want, keep pushing until the numbers cycles around to your choice.**

A P P E N D I X D

# Guide to Technical Documentation

IF YOU NEED TECHNICAL INFORMATION THAT ISN'T INCLUDED IN THIS MANUAL, OR IF you're interested in learning more about the Macintosh family of computers, this appendix will direct you to the information you need.

## Technical documentation

The *Inside Macintosh Library* is a set of technical books that explain the hardware and software of the Macintosh family of computers. The *Inside Macintosh Library* is a part of the Apple Technical Library—a series of official technical publications from Apple Computer, and published by Addison-Wesley Publishing Company. You'll find the Apple Technical Library in most well-stocked bookstores.

The original Macintosh technical documentation consisted solely of *Inside Macintosh,* a three-volume compendium covering the Macintosh Toolbox and Operating System for the original 64K Macintosh ROM, together with user interface guidelines and hardware information. With the introduction of the Macintosh Plus (128K ROM), Volume IV of *Inside Macintosh* was released. A fifth volume has now been added, covering the Macintosh SE and Macintosh II computers (both containing 256K of ROM). Volumes IV and V are delta guides; that is, they explain only what is different about the new machines.

With the growth of the Macintosh family, the documentation set has also grown, and *Inside Macintosh* has now expanded into a whole family of books: the *Inside Macintosh Library.* These books contain the complete reference information for the entire Macintosh family.

The following diagram illustrates the relationship of the various components of the Macintosh documentation set. All these books are described briefly in the bibliography that follows the diagram.

- *Inside Macintosh Library* and related books



***Inside Macintosh* Library**

*Inside Macintosh, Volumes I–III* Definitive guide to the Macintosh Toolbox and Operating System for the original 64K ROM. Volume III also includes hardware information and comprehensive summaries.

*Inside Macintosh, Volume IV* A delta guide to the Macintosh Plus, introducing the hierarchical file system (HFS), the Small Computer System Interface (SCSI), and the other new features available with the 128K ROM.

*Inside Macintosh, Volume V* A delta guide to the Macintosh SE and Macintosh II, introducing color, slots, new sound capabilities, the new Apple Desktop Bus, and all the other features available with the 256K ROM.

*Technical Introduction to the Macintosh Family* Introduction to the Macintosh software and hardware for Macintosh computers, including the original Macintosh, Macintosh Plus, Macintosh SE, and Macintosh II.

*Programmer's Introduction to the Macintosh Family* A short guide replete with examples illustrating the ins and outs of Macintosh programming.

*Macintosh Family Hardware Reference* Describes the hardware of the various Macintosh machines. It provides the information you'll need to connect non-Apple devices to the computer and to write device drivers or other low-level programs. The book consists of three parts, one each for the "Classic Macintosh" (Macintosh and Macintosh Plus), the Macintosh SE, and the Macintosh II.

*Designing Cards and Drivers for the Macintosh II and Macintosh SE* A guide for developers who are creating hardware products that will plug into the expansion slots of the Macintosh II and Macintosh SE. Parts of this book are also important to application software developers who need to understand slot devices.

**Related books**

*Human Interface Guidelines: The Apple Desktop Interface* Detailed guidelines for developers implementing the Macintosh user interface.

*Apple Numerics Manual, Second Edition* A guide to the Standard Apple Numeric Environment (SANE®), a full implementation of the IEEE floating-point standard, for developers who need high-precision floating-point support.

*Macintosh Programmer's Workshop 2.0 Reference* Description of the Macintosh Programmer's Workshop (MPW™), Apple's software development environment for all Macintosh computers.

Additional reference books cover the MacApp® application and the use of MPW in the C language, Pascal, and the macro assembler for the MC68000 family of processors.

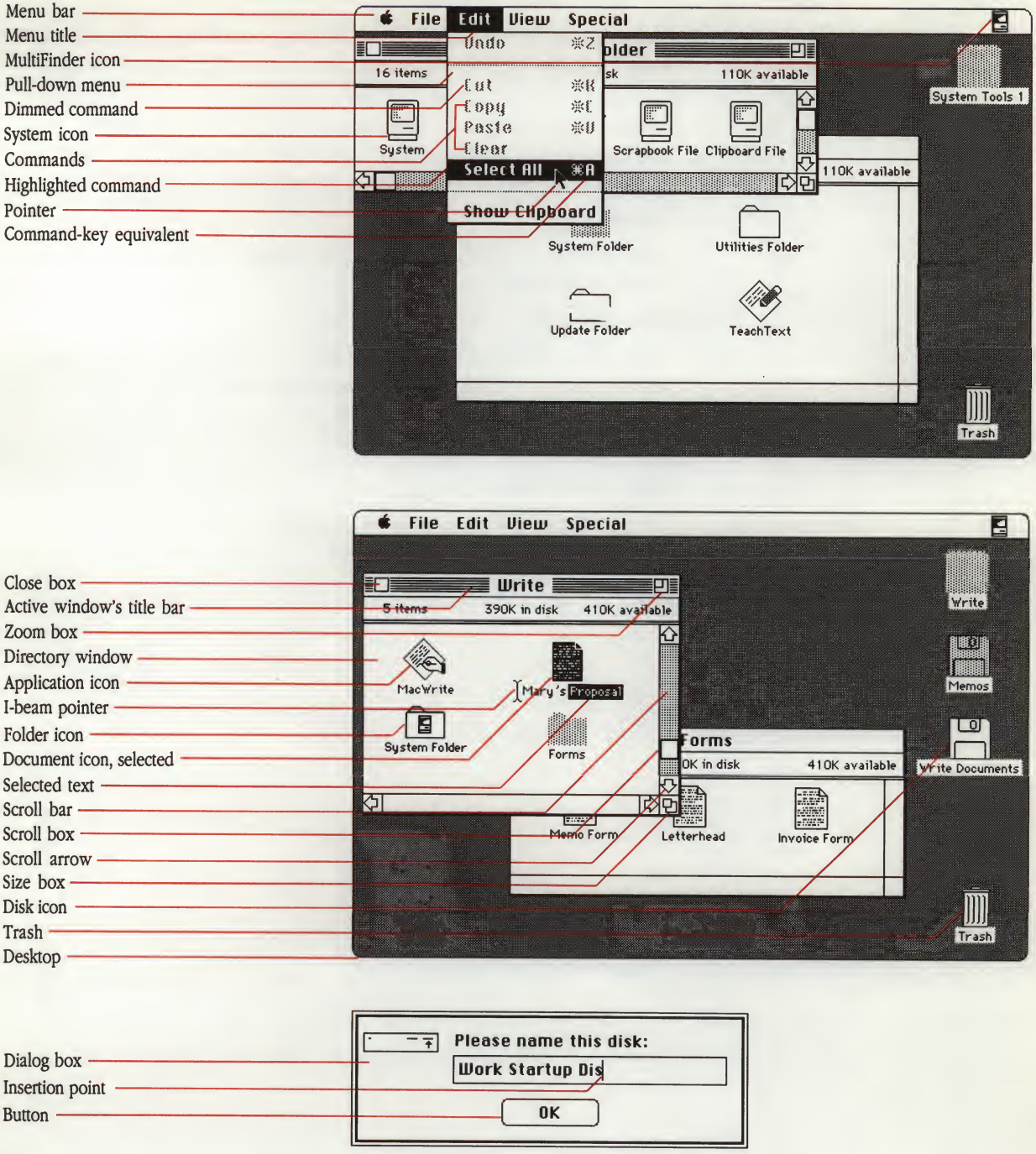
## For more information

Another source of technical information about the Macintosh IIx (and other Apple products) is the Apple Programmer's and Developer's Association (APDA™). For more information about the association, call (206) 251-6548. You can also write to

Apple Programmer's and Developer's Association
290 SW 43rd Street
Renton, WA 98055

If you plan to develop applications for sale through retail channels, you can get valuable support from Apple Developer Relations. Write to

Apple Developer Relations
Mailstop 27-W
Apple Computer, Inc.
20525 Mariani Avenue
Cupertino, CA 95014


Menu bar
Menu title
MultiFinder icon
Pull-down menu
Dimmed command
System icon
Commands
Highlighted command
Pointer
Command-key equivalent
File
Edit
View
Special
Undo ⌘Z
Cut ⌘K
Copy ⌘C
Paste ⌘U
Clear
Select All ⌘A
Show Clipboard
16 items
System
110K available
Scrapbook File
Clipboard File
System Tools 1
System Folder
Utilities Folder
Update Folder
TeachText
Trash
Close box
Active window's title bar
Zoom box
Directory window
Application icon
I-beam pointer
Folder icon
Document icon, selected
Selected text
Scroll bar
Scroll box
Scroll arrow
Size box
Disk icon
Trash
Desktop
Write
5 items
390K in disk
410K available
MacWrite
Mary's Proposal
System Folder
Forms
Memos
Write Documents
Memo Form
Letterhead
Invoice Form
Dialog box
Insertion point
Button
Please name this disk:
Work Startup Dis
OK

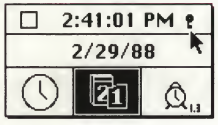
# Glossary

**accelerator card:** An expansion card that contains another processor that shares the work normally performed only by the computer's main microprocessor. An accelerator card speeds up processing time.

**active window:** The frontmost window on the desktop; the window where the next action will take place. An active window's **title bar** is highlighted.

**address:** A number that specifies the location of a single byte of data in RAM.

**address bus:** The hardware path along which the addresses for specific memory locations are transmitted. The width of the path determines how much memory can be used (addressed) directly by the computer.




**Alarm Clock:** A **desk accessory** that displays the current date and time, and lets you set an alarm.

**alert box:** A box that appears on the screen to give a warning or to report an error message. The warning is accompanied by an alert sound.

**Apple Desktop Bus (ADB):** A low-speed serial bus with connectors on the back panel of the computer to which you attach the keyboard, mouse, and other Apple Desktop Bus devices, such as graphics tablets, hand controls, and specialized keyboards.

**Apple HD SC Setup:** A utility program that you use to initialize and test SCSI hard disks.




**Apple menu:** The menu farthest to the left in the menu bar, indicated by an Apple symbol, from which you choose **desk accessories.**

**AppleTalk network system:** The system of network software and hardware built into the computer and used in various implementations of Apple's communication networks.

**application program:** A program that performs a specific task, such as word processing, database management, or graphics—sometimes called an *application.*

**arrow keys:** The four directional keys on the keyboard that, when pressed, move the insertion point. Sometimes called *cursor keys.*

**ASCII:** Acronym for *American Standard Code for Information Interchange,* pronounced "ASK-ee." A standard used to represent text inside a computer and to transmit text between computers or between a computer and a peripheral device.

**audio jack:** A connector on the back panel of the computer to which you can attach headphones or other audio devices.

**background printing:** A type of background processing that lets you print documents in the background while using the computer to perform other work.

**background processing:** In multitasking environments, the operating system's ability to process lower-priority tasks while you perform other work on the computer.

**Backspace key:** A key that backspaces over and erases the previously typed character or the current selection. Its function is identical to that of the Delete key on newer Macintosh keyboards.

**binary:** Characterized by having two different components, or by having only two alternatives or values available; sometimes used synonymously with **binary system.**

**binary digit:** The smallest unit of information in the binary system; a 0 or a 1. Also called a **bit.**

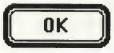
**binary system:** A numbering system analogous to the more familiar decimal system, but using only 0 and 1 instead of 0 through nine, and each digit representing successive powers of two instead of ten. For example, the binary number 101011 is 43 in decimal. The binary system is useful because the values 0 and 1 can easily be represented in a variety of ways, such as the presence or absence of current, positive or negative voltage, or a white or black dot on the display screen. A single binary digit—0 or 1—is called a **bit.**

**bit:** A contraction of *binary digit.* The smallest unit of information that a computer can hold. The value of a bit (1 or 0) represents a simple two-way choice, such as yes or no, on or off, positive or negative, something or nothing. See also **binary system.**

**bitmapped display:** A display whose image is a representation of bits in an area of RAM called the **screen buffer.** With such a display, each dot, or **pixel,** on the screen corresponds, or is "mapped," to a bit in the screen buffer.

**bridge:** A device that lets you connect two or more networking systems together. See also **zone.**

**bus:** A path along which information is transmitted electronically within a computer. Buses connect computer devices, such as processors, expansion cards, input devices, and RAM. See **Apple Desktop Bus, NuBus,** and **SE Bus.**




**button:** A pushbutton-like image in dialog boxes where you click to designate, confirm, or cancel an action. Compare **mouse button.**

**byte:** A unit of information consisting of a fixed number of **bits.** A byte can represent any value between 0 and 255. The sequence of bits in a byte represents an instruction, letter, number, punctuation mark, or other character. Compare **gigabyte, kilobyte, megabyte.**

**Calculator:** A desk accessory that works like a four-function pocket calculator. Calculation results can be cut and pasted into your documents using the Edit menu.

**Cancel button:** A button that appears in a dialog box. Clicking it cancels the command.

**Caps Lock key:** A key that, when engaged, causes subsequently typed letters to appear in uppercase. It is like a Shift key that applies only to alphabetic characters.

**character keys:** Any of the keys on a computer keyboard—such as letters, numbers, symbols, and punctuation marks—used to generate text or to format text; any key except Shift, Caps Lock, Command, Option, Control, and Esc. Character keys repeat when you press and hold them down.

**check box:** A small box associated with an option in a dialog box. When you click the check box, you may change the option or affect related options.

**chip:** A term for *integrated circuit,* an electronic circuit entirely contained in a single piece of semiconducting material, usually silicon.

**choose:** To pick a command by dragging through a menu. You often choose a command after you've selected something for the application to act on; for example, selecting a disk and choosing the Open command from the File menu.

**Chooser:** A desk accessory that lets you configure your computer system to print on any printer for which there's a printing resource on the current startup disk. If you're part of an AppleTalk network system, you use the Chooser to connect and disconnect from the network and to choose among devices connected to the network. You can also specify a user name that the computer uses from time to time—when you're printing on a LaserWriter, for example.

**Clear key:** A key on the numeric keypad that clears the entry in the Calculator desk accessory and in applications that require numeric entry and calculations, such as spreadsheets.



**click:** To position the pointer on something, and then to press and quickly release the mouse button.

**Clipboard:** The holding place for what you last cut or copied. Information on the Clipboard can be inserted (pasted) into documents.

**close:** To turn a window back into the icon that represents it by choosing the Close command or by clicking the close box in the left corner of the window's title bar.



**close box:** The small white box on the left side of the title bar of an active window. Clicking it closes the window.

**code:** The statements or instructions that make up a computer program.

**color wheel:** A dialog box that appears when you click the Change Color button in the Control Panel desk accessory. The color wheel lets you adjust hue, saturation, and brightness.

**command:** A word or phrase, usually in a menu, describing an action for the computer to perform.



**Command key:** A key that, when held down while another key is pressed, causes a command to take effect. The Command key is marked with a propeller-shaped symbol. On some keyboards, the Command key has both the propeller symbol and an Apple symbol on it.

**compatible:** Capable of running without problems on the computer system. Applications are normally written to run on specific types of computers; applications that run on a computer system are said to be "compatible" with the computer.

**configuration ROM:** A chip on a NuBus expansion card that contains the information the computer's microprocessor needs to communicate with the card, or with peripheral devices attached to the card.

**Control Panel:** A desk accessory that you use to change the speaker volume, the keyboard repeat speed and delay, mouse tracking, and color display; set the system clock; create a RAM cache; and set other preferences.

**convergence:** An adjustment you make with an RGB color monitor to ensure that its red, green, and blue beams are aimed correctly for the best color picture. You can test your monitor's convergence by using the Control Panel desk accessory.

**coprocessor:** An auxiliary processor designed to relieve the demand on the main microprocessor by performing a few specific tasks. Coprocessors may favor a certain set of operations, such as floating-point calculations. Generally, coprocessors handle tasks that could be performed by the main microprocessor running appropriate software, but which would be performed much more slowly that way. Other coprocessors allow you to run software that would otherwise be incompatible with the computer's main microprocresssor.

**copy-protect:** To make a disk uncopyable. Software publishers frequently copy-protect their disks to prevent them from being illegally duplicated by software pirates.

**current startup disk:** The disk that contains the System Folder the computer is currently using. The startup disk icon always appears in the upper-right corner of the Finder desktop.

**cut:** To remove something by selecting it and choosing Cut from a menu. What you cut is placed on the Clipboard. In other editing applications, delete serves the same function.

**daisy-chain:** To link together sequentially.

**data:** Information, especially information used or operated on by a program. The smallest unit of information a computer can understand is a **bit.**

**data bus:** The path along which data is transmitted within the computer. The wider the data bus, the more data can be transmitted at once.

**Delete key:** A key that moves the insertion point backward, removing the previously typed character, or that removes the current selection. Its function is identical to that of the Backspace key on some Macintosh keyboards.

**desk accessories:** "Mini-applications" that are available on the desktop from the Apple menu regardless of which application you're using. Examples are the Calculator, Alarm Clock, and Scrapbook.

**desktop:** Your working environment—the menu bar and the gray area on the screen. The desktop displays the Trash icon and the icons of any disks in the system's disk drives.

**destination:** The duplicate, as opposed to the original (or **source**), in making a copy of a document, folder, or disk.

**dialog box:** A box that contains a message requesting more information from you. Sometimes the message is a warning that you're asking your computer to do something it can't do, or that you're about to destroy some information. In these cases the message is often accompanied by a beep. See also **alert box.**



**dimmed command:** A command that appears gray rather than black in a menu bar because that command is unavailable at the moment. For example, in an application, the Cut command is dimmed unless you have selected a piece of text or graphics to cut.

**dimmed icon:** An icon that represents an opened disk or folder, or a disk that has been ejected. You can select and open dimmed disk icons, but you cannot open the documents on them.

**directory:** A pictorial, alphabetical, or chronological list of the contents of a folder or a disk.

**directory dialog box:** A type of dialog box you use to work in the hierarchical file system from within an application. Such dialog boxes appear whenever you choose the Open or Save As commands from within an application. See **hierarchical file system.**

**directory window:** A window that shows you the contents of a disk or folder.



**disk:** An information-storage medium consisting of a flat, circular, magnetic surface on which information can be recorded in the form of small magnetized spots, in a manner similar to the way sounds are recorded on tape. See **hard disk, 3.5-inch disk.**

**disk buffer:** An area in RAM used by the operating system as a temporary holding area before it saves the information on a disk.

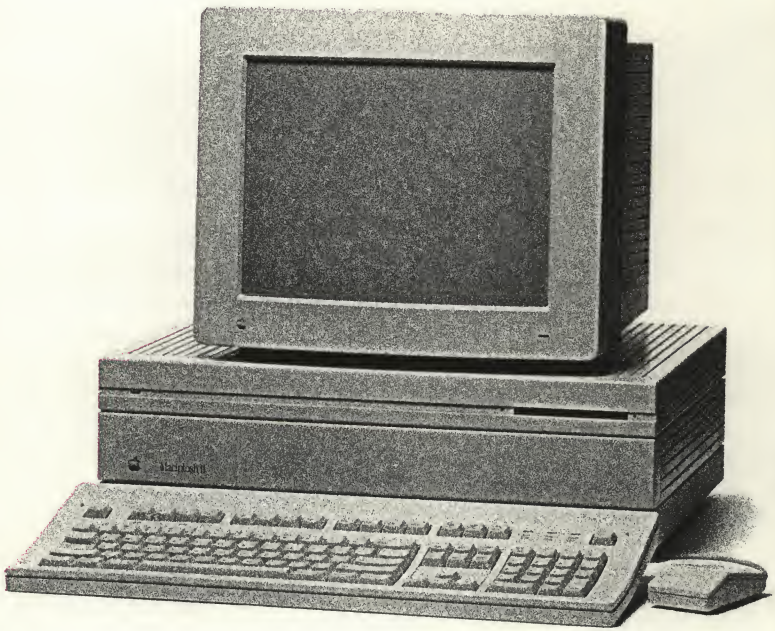
**disk capacity:** The maximum amount of data a disk can hold, usually measured in kilobytes (K) or megabytes (MB). For instance, Apple 3.5-inch disks typically have a disk capacity of 400K, 800K, or 1.4 MB.

**disk directory:** An index of a disk's contents. It holds the names and locations of every file on its disk.

**disk drive:** The device that holds a disk, retrieves information from it, and saves information to it. A hard disk drive has the disk permanently encased. A 3.5-inch disk drive requires that you insert a 3.5-inch disk.

**disk drive port:** A port used to attach external disk drives to the Macintosh Plus and Macintosh SE.

# Macintosh® IIx
# Owner's Guide



APPLE COMPUTER, INC.

This manual and the software described in it are copyrighted, with all rights reserved. Under the copyright laws, this manual or the software may not be copied, in whole or part, without written consent of Apple, except in the normal use of the software or to make a backup copy of the software. The same proprietary and copyright notices must be affixed to any permitted copies as were affixed to the original. This exception does not allow copies to be made for others, whether or not sold, but all of the material purchased (with all backup copies) may be sold, given, or loaned to another person. Under the law, copying includes translating into another language or format.

You may use the software on any computer owned by you, but extra copies cannot be made for this purpose.

© Apple Computer, Inc., 1988
20525 Mariani Avenue
Cupertino, CA 95014
(408) 996-1010
Apple, the Apple logo, Apple*Care*, AppleLink, AppleTalk, HyperCard, ImageWriter, LaserWriter, MacApp, Macintosh, and SANE are registered trademarks of Apple Computer, Inc.

APDA, AppleCD SC, AppleColor, Apple Desktop Bus, AppleFax, Apple FDHD, EtherTalk, Finder, LocalTalk, and MPW are trademarks of Apple Computer, Inc.

Ethernet is a registered trademark of Xerox Corporation.

ITC Zapf Dingbats is a registered trademark of International Typeface Corporation.

Linotronic is a registered trademark of Linotype Co.

Microsoft and MS-DOS are registered trademarks of Microsoft Corporation.

NuBus is a trademark of Texas Instruments.

POSTSCRIPT is a registered trademark, and Illustrator is a trademark, of Adobe Systems Incorporated.

UNIX is a registered trademark of AT&T Information Systems.

Varityper is a registered trademark, and VT600 is a trademark, of AM International, Inc.





**document:** Whatever you create with an application—information you enter, modify, view, or save.

**dot pitch:** A measure of the distance between dots on the screen. The closer the dots, the sharper and clearer the image.



**double-click:** To position the pointer where you want an action to take place, and then press and release the mouse button twice in quick succession without moving the mouse. Double-clicking is typically a quicker way of performing common tasks.



**drag:** To position the pointer on something, press and hold the mouse button, move the mouse, and release the mouse button.

**Easy Access:** A feature of system software that assists people who have difficulty typing with both hands on the keyboard, or manipulating the mouse. See **mouse keys, sticky keys.**

**Enter key:** A key that confirms an entry or sometimes a command.

**ergonomics:** The science of designing work environments that allow people and things to interact efficiently and safely. Sometimes called *human engineering.*

**EtherTalk:** A high-speed AppleTalk network system that uses the cables of an Ethernet network. Ethernet is a widely used communications network.

**expansion card:** A circuit board that implements specialized functions not otherwise supported by the computer. Expansion cards are installed in expansion connectors or expansion slots.

**expansion connector:** A connector inside the computer that lets you install an **expansion card** to enhance or extend the computer's performance.

**file:** Any collection of information stored on a disk—a document, a folder, a system file or resource, an application.

**file server:** A combination of controller software and a mass-storage device that allows computer users to share common files and applications through a network.

**Finder:** The application that maintains the Macintosh desktop and starts up other applications at the user's request. You use the Finder to manage documents and applications, and to get information to and from disks.

**Find File:** A desk accessory that lets you find any folder or file on a disk.

**firmware:** Software instructions contained in the Macintosh ROM. Firmware is permanent and unchangeable.

**floating-point unit (FPU):** See **Motorola 68881.**



**folder:** A holder of documents, applications, and other folders on the desktop. Folders allow you to organize information in any way you want.

**font:** A complete set of characters in one design, size, and style. Geneva 9-point Italic is an example of a Macintosh font.

**Font/DA Mover:** A utility program that lets you add or remove fonts and desk accessories in your System file.

**GCR:** An abbreviation for *Group-Coded Recording,* the disk formatting standard used by Macintosh computers. See also **MFM.**

**gigabyte (GB):** A unit of measurement equal to 1024 ($2^{10}$) megabytes. Compare **byte, kilobyte, megabyte.**

**gray scale:** Shades of gray on the screen that are created by varying the intensity of the screen's pixels, rather than by using a combination of only black and white pixels to produce shading.

**hard disk:** A disk made of metal and sealed into a drive or cartridge. A hard disk can store very large amounts of information compared with 3.5-inch disks.

**hardware:** In computer terminology, the machinery that makes up a computer system. Compare **firmware, software.**

**hierarchical file system (HFS):** A feature of system software that lets you use folders to organize documents, applications, and other folders on a disk. Folders (analogous to subdirectories in other systems) can be nested in other folders to create as many levels as you need.

**highlight:** To make something visually distinct from its background, usually to show that it has been selected or chosen.



**I-beam:** A type of pointer used in entering and editing text.

**icon:** A graphic representation of an object, a concept, or a message, usually used to represent disks, applications, folders, documents, and so on.

**initialize:** To prepare a disk to receive information. Initializing a disk divides its surface into **tracks** and **sectors,** which the operating system uses to keep track of the contents of the disk.

**input device:** A device that sends information to the microprocessor. The mouse and keyboard are the Macintosh's primary input devices. Compare **output device.**

**insertion point:** The place in a document where something will be added. You set an insertion point by clicking. It is represented by a blinking vertical bar.

**Installer:** A utility program that lets you choose an Installation script for updating your system software.

**instruction set:** The complete range of instructions a microprocessor can interpret. Each brand of microprocessor has its own instruction set.

**K:** See **kilobyte.**

**keyboard shortcut:** A keystroke that you can use instead of a mouse action to perform a task. For example, pressing the Command and the X keys at the same time is the same as choosing the Cut command from the Edit menu.

**Key Caps:** A desk accessory that shows you the optional character set available for a given font family.

**kilobyte (KB):** A unit of measurement consisting of 1024 ($2^{10}$) bytes. Often abbreviated K. Compare **byte, gigabyte, megabyte.**

**local area network (LAN):** A group of computers connected for the purpose of sharing resources. The computers on a local-area network are typically joined by a single transmission cable, and are located within a small area such as a single building or section of a building.

**LocalTalk:** A low-cost AppleTalk network system that lets you link up to 32 computers or devices together to form a local-area network.

**lock:** To prevent documents from being edited, discarded, or renamed, or to prevent entire disks from being altered. Compare **write-protect.**

**Macintosh Operating System:** The combination of ROM-based and disk-based routines that together perform basic tasks such as starting the computer, moving data to and from disks and peripheral devices, and managing memory space in RAM.

**Macintosh User Interface:** The standard conventions for interacting with Macintosh computers. The interface ensures users a consistent means of interacting with all Macintosh computers and the applications designed to run on them.

**main unit:** The computer console, which contains the processor, memory, the built-in disk drive(s), the internal hard disk, and, on the Macintosh Plus and SE, the screen.

**megabyte (MB):** A unit of measurement equal to 1024 ($2^{10}$) kilobytes. Compare **byte, gigabyte, kilobyte.**

**memory:** The place in the computer's main unit that stores information. Macintosh computers include a minimum of 1 megabyte of RAM (random-access memory) that you can use for your work, and 256K of ROM (read-only memory) that stores certain system information permanently. See also **RAM** and **ROM.**




**menu:** A list of commands that appears when you point to and press the menu title in the menu bar. Dragging through the menu and releasing the mouse button while a command is highlighted chooses that command.

**menu bar:** The horizontal strip at the top of the screen that contains menu titles.

**menu title:** A word or phrase in the menu bar that designates one menu. Pressing on the menu title causes the title to be highlighted and its menu to appear below it.

**MFM:** An abbreviation for *Modified Frequency Modulation,* the disk-formatting standard used by IBM and IBM-compatible computer systems. See also **GCR.**

**microprocessor:** An integrated circuit on the computer's main circuit board. The microprocessor carries out software instructions by directing the flow of electrical impulses through the computer.

**modem port:** One of two **serial communication** ports on the back panel of the computer.

**Motorola 68000:** The microprocessor in the Macintosh Plus and SE computers.

**Motorola 68020:** The microprocessor in the original Macintosh II.

**Motorola 68030:** An enhanced version of the Motorola 68020 microprocessor included in the Macintosh IIx.

**Motorola 68851:** An optional coprocessor available for the original Macintosh II that allows paged memory management, a technique that lets the microprocessor access a much larger body of data than can fit in RAM at one time. Sometimes referred to as the *Paged Memory Management Unit,* or *PMMU.*

**Motorola 68881:** A coprocessor chip that provides high-speed support for processing scientific computations. Sometimes also referred to as the *floating-point unit,* or *FPU.*

**Motorola 68882:** An enhanced version of the Motorola 68881 coprocessor.



**mouse:** The small mechanical device whose movement on your desk corresponds to pointer movements on your screen.

**mouse button:** The button on the top of the mouse. In general, pressing the mouse button initiates some action on whatever is under the pointer, and releasing the button confirms the action.

**mouse keys:** An Easy Access feature that lets you manipulate the pointer using the 10-key numeric keypad instead of the mouse. See **Easy Access.**

**MultiFinder:** A multitasking operating system for Macintosh computers that makes it possible to have several applications open at the same time, including background applications that let you perform one task while the computer performs another.

**nesting:** Placing folders inside other folders. See **hierarchical file system.**

**network:** A collection of interconnected, individually controlled computers, together with the hardware and software used to connect them. A network allows users to share data and peripheral devices such as printers and storage media, to exchange electronic mail, and so on.

**Note Pad:** A desk accessory that lets you enter and edit small amounts of text while working on another document.

**NuBus:** An **address** and **data bus** incorporated into the system architecture of the Macintosh II and Macintosh IIx. The NuBus architecture lets you add a variety of components to the system, by means of **expansion cards** installed in **NuBus expansion slots** inside the Macintosh II and Macintosh IIx.

**NuBus expansion slots:** The six slots on the main circuit board of the Macintosh IIx to which you add cards for video monitors and peripheral devices, coprocessors, and network interfaces. See **expansion card.**

**numeric keypad:** The set of keys on the right side of the keyboard that let you enter numbers and perform calculations quickly.

**numeric keys:** See **numeric keypad.**

**open:** To create a window from an icon so you can view a document or directory.

**open architecture:** A computer system's ability to use a variety of optional components designed to meet specialized needs, such as video, coprocessing, networking, and so on. An "open" system is one to which a user with no technical background can easily add devices and expansion cards to customize the system.

**operating system:** See **Macintosh Operating System.**

**Option key:** A key used to give an alternate interpretation to another key you type. You use it to type international characters or special symbols.

**output device:** A device that receives information from the microprocessor. The monitor is the Macintosh's primary output device. Compare **input device.**

**Paged Memory Management Unit (PMMU):** See **Motorola 68851.**

**parallel communication:** A form of data communication in which the eight bits in each byte of data move along eight separate parallel lines inside a single cable.

**paste:** To put a copy of the contents of the Clipboard—whatever was last cut or copied—at the insertion point.

**patch code:** Software instructions contained in the System file that override some routines in ROM. Patch code is used for periodic upgrades of ROM routines.

**peripheral device:** A piece of computer hardware—such as a disk drive, printer, or modem—used in conjunction with a computer and under the computer's control. Peripheral devices are usually physically separate from the computer and connected to it by wires or cables.

**pixel:** An individual dot on the screen. With a simple monochrome video display, a pixel is the visual representation of a single bit in the screen buffer (white if the bit is 0, black if it is 1). With color or gray-scale video displays, each pixel on the screen may represent several bits.

**plain-text documents:** Documents consisting only of readable ASCII characters, without any formatting codes specific to a particular full-feature word processing application.



**pointer:** A small shape on the screen, most often an arrow pointing up and to the left, that follows the movement of the mouse.

**port:** A socket on the back panel of the computer where you can plug in a cable to connect a peripheral device, another computer, or a network.



**Power On key:** A key on the keyboard that starts the Macintosh IIx.

**press:** To position the pointer on something and then hold down the mouse button without moving the mouse.

**PrintMonitor:** An application that monitors background printing and provides options intended to give you additional control over what happens to documents you are printing. See **background processing.**

**printer port:** One of two **serial communication** ports on the back panel of the computer.

**printer resource:** A file in the System Folder that provides information the microprocessor needs to communicate with a printer.

**RAM:** An acronym for *random-access memory,* the memory chips that store information temporarily while you're working on it. RAM can contain both application programs and your own information. Information in RAM is temporary, gone forever if you switch the power off. See also **ROM.**

**RAM cache:** RAM you can designate to store certain information an application uses repeatedly. Using the RAM cache can greatly speed up your work, but may need to be used sparingly or not at all with applications that require large amounts of memory. You set the RAM cache in the Control Panel.




**Read Me documents:** Plain-text documents that are included on application and system software disks to provide you with late-breaking information about the product. You'll usually find Read Me documents in the Update Folder on the disk.

**read-only memory:** See **ROM.**

**register:** A location in a processor or other chip where an item of information is held and modified by a program.

**resources:** Files contained in the System Folder that provide information the microprocessor needs to communicate with devices attached to the computer system.

**Return key:** A key that makes the insertion point move to the beginning of the next line. It's sometimes used to confirm or terminate an entry or a command.

**ROM:** An acronym for *read-only memory,* the memory chips that contain information the computer uses (along with system files) throughout the system, including the information it needs to get itself started. Information in ROM is permanent; it doesn't vanish when you switch the power off. See also **RAM.**

**routine:** A sequence of software instructions.

**save:** To store information from RAM onto a disk.

**scanning order:** The order in which the operating system scans the disk drives looking for a startup disk.

**Scrapbook:** A desk accessory in which you can save frequently used pictures and text.

**screen buffer:** A portion of memory in RAM from which the video display reads the information to be displayed on the screen.

**scroll:** To move the contents of a window, or a list in a dialog box, by means of the scroll bar or scroll arrows.



**scroll arrow:** An arrow on either end of a scroll bar. Clicking a scroll arrow moves the document or directory one line. Pressing a scroll arrow scrolls the document continuously.

**scroll bar:** A rectangular bar that may be along the right or bottom of a window. Clicking or dragging in the scroll bar causes the view of the document to change.

**scroll box:** The white box in a scroll bar. The position of the scroll box in the scroll bar indicates the position of what's in the window relative to the entire document.

**SCSI:** An acronym for *Small Computer System Interface,* an industry standard interface that provides high-speed access to peripheral devices.

**SCSI port:** The port on the back panel of the computer to which you connect **SCSI** devices.

**SE Bus:** A direct data path to the microprocessor, implemented through a 96-pin expansion connector inside the Macintosh SE. Expansion cards for the SE Bus include accelerator cards and coprocessor cards.

**SE Bus access port:** An insert on the back panel of the Macintosh SE that allows access to the SE Bus expansion connector inside the computer. Used only for cables that run between an **expansion card** and a **peripheral device.**

**sector:** A part of a track on the surface of a disk. When a disk is first initialized, the operating system divides the disk's surface into circular tracks, with each track divided into sectors. Tracks and sectors are used to organize the information stored on a disk.

**select:** To designate where the next action will take place. To select, you click or drag across information.

**selection:** The information affected by the next command. The selection is usually highlighted.

**serial communication:** A form of data communication in which the eight bits in each byte of data move single-file—serially—down one line inside a cable.

**serial interface:** An interface in which information is transmitted sequentially, one bit at a time, over a single wire or channel.

**serial ports:** The connectors on the back panel of the computer for devices that use a **serial interface.** See also **modem port** and **printer port.**

**Shift-click:** A technique that lets you extend or shorten a selection by holding down the Shift key while you select (or deselect) something related to the current selection.

**Shift key:** A key that, when pressed, causes subsequently typed letters to appear in uppercase, and causes the upper symbol to appear when number or symbol keys are typed.

**SIMM:** An acronym for *Single In-line Memory Module,* a circuit board that contains RAM or ROM chips. SIMMs attach to SIMM sockets on the computer's main circuit board.



**size box:** A box at the bottom-right corner of most active windows that lets you resize the window.

**software:** Programs, or instructions for the computer to carry out. The computer reads these instructions from disks or from ROM.

**source:** The original, as opposed to the duplicate (or **destination**), in making a copy of a document, folder, or disk.

**spooling:** In printing or sending a document, the application's ability to create a temporary file for the document and return control of the computer to you while the document is processed in the background. See **background processing.**

**startup disk:** A disk that contains the system files the computer needs to get itself started. A startup disk must have at least a Finder and a System file. It may also contain files such as printing resources, Scrapbook, and Clipboard.

**sticky keys:** An Easy Access feature that lets you type combination keystrokes without actually pressing the keys simultaneously. See **Easy Access.**

**style:** A stylistic variation of a font, such as italic, underline, shadow, or outline.

**System file:** A file the computer uses to start itself up or to provide system-wide information. Although system files are represented by icons just as documents and applications are, they can't be opened in the usual way. You can, however, alter their contents. For example, you can use the Font/DA Mover to change the contents of the System file. See also **startup disk.**

**System Folder:** A folder on a disk that includes at least the Finder and the System file—two files the computer needs to start itself up. When you first turn on the computer, the operating system looks in the disk drives for a disk containing a System Folder. The first disk it finds with a System Folder becomes the **current startup disk.**

**system software:** The set of files and resources in the System Folder that the computer uses to run itself.

**Tab key:** A key that, when pressed, moves the insertion point to the next tab marker or, in a dialog box with more than one place to enter information, to the next text box.




**TeachText:** An application on the *Macintosh System Tools* disk that lets you read **plain-text documents.**

**terminator:** A device used in a SCSI chain to maintain the integrity of the signals passing along the SCSI chain. A SCSI chain should never have more than two terminators, one at each end of the chain. See **SCSI.**

**text box:** The place or places in any dialog box where you can type information.

**3.5-inch disk:** A flexible plastic disk measuring 3.5 inches in diameter and having a hard-shell plastic jacket.

**title bar:** The horizontal bar at the top of a window that shows the name of the window and lets you move it.

**track:** A portion of a disk's surface. When a disk is first initialized, the operating system divides the disk's surface into circular tracks, with each track divided into sectors. Tracks and sectors are used to organize the information stored on a disk.



**Trash:** An icon on the desktop that you use to discard documents, folders, and applications.

**Update Folder:** A folder on the System Tools disk, and on other application and system disks, that contains **Read Me documents.**

**user group:** A computer club where computer users exchange tips and information, usually about a particular brand of computer.

**user interface:** See **Macintosh User Interface.**

**User Interface Toolbox:** Routines in ROM that provide application program developers with templates for windows, dialog boxes, icons, menus, and other standard elements of the **Macintosh User Interface.**

**utility program:** A special-purpose application that alters a system file or lets you perform some useful function on your files. Examples are the Font/DA Mover and the Installer.

**window:** An area that displays information on the desktop. You view documents through a window. You can open or close a window, move it around on the desktop, and sometimes change its size, edit its contents, and scroll through it.

**word wrap:** The automatic continuation of text from the end of one line to the beginning of the next. Word wrap lets you avoid pressing the Return key at the end of each line as you type.

**wristwatch:** The pointer that you see on the screen when the computer is performing an action that causes you to wait.

**write-protect:** To protect the information on a disk. You write-protect, or **lock,** a 3.5-inch disk by sliding the small tab in the left corner on the back of the disk toward the disk's edge.

**zone:** A network in a series of interconnected networks, joined through **bridges.**



**zoom box:** The small box on the right side of the title bar of some windows. Clicking the zoom box expands a window to its maximum size. Clicking it again returns the window to its original size.

# Index


A

ADB. *See* Apple Desktop Bus
address 38
address bus 34
addressing 82–84
altitude 87
American Standard Code for Information Interchange (ASCII) 35
APDA 107
Apple*Care* Service Agreement 79
AppleColor High-Resolution RGB Monitor 8, 40. *See also* monitor
  size and weight 88
Apple Desktop Bus 19–20, 64, 83–84
  power requirements 89–90
  rearranging devices on 20
Apple Desktop Bus ports 19–20, 64
  pin assignments 93–95
Apple Developer Relations 107
Apple Extended Keyboard 48–49, 64. *See also* keyboard
  power requirements 89
  size and weight 88
Apple High-Resolution Monochrome Monitor 8, 40. *See also* monitor
  size and weight 88
Apple Keyboard 48–49, 64. *See also* keyboard
  power requirements 89
  size and weight 88
AppleLink 78
Apple Programmer's and Developer's Association 107
AppleTalk 66–67
Apple Technical Library 104
applications
  quitting 60
  starting up 58
ASCII (American Standard Code for Information Interchange) 35
assembling the system 6–21
attaching. *See* connecting
audio jack 4, 64, 68
  pin assignments 95
axles (mouse) 47

B

battery (clock), care of 77
binary digits. *See* bits
binary numbering system 34
bitmapped display 41
bitmapped image 41
bits 34
bits per inch (bpi) 44
blinking question mark icon 23–24
bpi (bits per inch) 44
brightness control 24
buses 34. *See also* Apple Desktop Bus; NuBus
bytes 34

C

cables
  keyboard 2, 18–19
  mouse 18
  peripheral 95–96
  SCSI 98–101
  video 2, 15–16
calendar/clock, specifications 87
cards. *See* expansion cards; NuBus; *or specific card*
care 71–77
cathode-ray tube (CRT) 40
chair height 5
character keys. *See* keyboard
cleaning. *See* care *or specific device*
clock battery, care of 77
clock/calendar, specifications 87
clock frequency 82–84
code 34–35, 53, 58, 60
color monitors. *See* AppleColor High-Resolution RGB Monitor
Command key 27
compatible, defined 33
configuration ROM 65
connecting. *See also* installing video card
  keyboard 17–20
  monitor 8–17
  mouse 17–18
  other devices 21
  power cord 6–7, 16–17
  programmer's switch 88–89
  SCSI devices 21, 97–101
  video cable 15–16
connectors. *See* ports
contrast control 24
coprocessors 35, 82–84. *See also* microprocessors *or specific microprocessor*
  specifications 86
CRT. *See* cathode-ray tube
current startup disk 56

**D**

daisy chain 18
data bus 34
desk accessories 53
desktop 52–55
device drivers. *See* resources
disk buffer 45
disk directory 44, 58–60
disk drives 42–46
  hard 3, 24, 28, 43, 95
  3.5-inch 3, 25, 42–43, 56
disk motor 42
disks 42–46. *See also specific disk*
  capacity of, specifications 86
  ejecting 45
  locking 46
  reinitializing 45
  removing 45
  startup 56
  3.5-inch 42, 44, 46, 76–77
  updating 28
display. *See* monitor; video displays
documents
  creating 58
  revising 59–60
  saving 59
DRAM chips 92

**E**

environment specifications 87
ergonomics 5–6
Ethernet network 67
EtherTalk 67
EtherTalk Interface Card 67
expansion cards 14, 35, 90
  installing 14
  *See also* NuBus *or specific card*
expansion cover shield 11–12
expansion slot covers 4, 12, 64
expansion slots 10–13, 82–84, 90
  *See also* NuBus
external 3.5-inch disk drive 82–84

**F**

Finder 28, 45, 54, 57
firmware 39
floating-point unit (FPU). *See* Motorola 68882
fonts 53
formatting. *See* initializing
FPU (floating-point unit). *See* Motorola 68882

**G**

GCR 44
grounded outlet 6–8
guide rail 43

**H**

hard disk drives 43, 82–84
  care of 72
  internal 3, 24, 28
  peripheral cables for 95
hardware memory management 39, 82–84
HyperCard disks 2
*HyperCard User's Guide* xi, 2

**I, J**

icons 3, 23, 47, 57
ImageWriter, peripheral cables for 96
initializing 44
input devices 47
input specifications 87
*Inside Macintosh Library* 103–106
Installer 28
installing video card 8–14. *See also* connecting
instruction set 32
interfaces, specifications 86
internal hard disk drive 3, 22, 28
  care of 72
  starting up 24
internal 3.5-inch disk drive 82–83
interrupter wheels 47
interrupt priority 66
interrupt switch. *See* programmer's switch
in-use light 3
I/O shield 11

**K**

K (kilobytes) 35
KB (kilobytes) 35
keyboard 2, 48–49, 64, 82–84
  cable 2, 18–19
  care of 74
  connecting 17–20
  layouts 48, 49
  position of 5–6
  power requirements 89
  size and weight 88
  specifications 87
kilobytes (KB) 35

**L**

LaserWriter, peripheral cables for 96
local area networks 66–67
LocalTalk 66
locking disks 46

**M**

Macintosh Operating System 40, 43, 44, 45, 44, 57–60, 104
*Macintosh Printing Tools* disk xi
*Macintosh Quick Reference Card* 2
*Macintosh System Software User's Guide* xi
*Macintosh System Tools* disk xi, 28
Macintosh IIx Video Card 41
Macintosh User Interface 40, 47
*Macintosh Utilities* disks xi, 2
*Macintosh Utilities User's Guide* xi, 2
main circuit board 33
main power input unit 4, 6

main unit 3
  care of 72–73
  monitor and 20–21
  power cord 2
  size and weight 88
  ventilation 20, 72
manuals, using x–xiii
MB (megabytes) 38
megabytes (MB) 38
memory 38, 57–60. *See also* RAM; ROM
  banks 91–92
  management (hardware) 39, 82–84
  SIMMs 39, 88, 91–93
  specifications 86
MFM 44
microprocessors 32–34, 82–84. *See also* coprocessors *or specific Motorola microprocessor*
  specifications 86
modem port 4, 64, 66
  pin assignments 93
modems, peripheral cables for 95
monitor. *See also* video displays *or specific monitor*
  care of 74
  connecting 8–17
  positioning of 5–6, 20
  power cord 2, 16–17
  size and weight 88
  specifications 87
  video cable 2
  viewing angle 5–6
monitor power input unit 15
monitor power output unit 4, 16
monochrome monitors. *See* Apple High-Resolution Monochrome Monitor
motor 42
Motorola 68000 33, 82–83
Motorola 68020 33, 84
Motorola 68030 32, 33, 35, 39, 65, 84
Motorola 68851 84
Motorola 68881 84
Motorola 68882 35, 84
mouse 2, 47–48, 57
  care of 75–76
  connecting 17–18
  power requirements 89
  size and weight 88
  specifications 87
multitasking 39

N

networks 66–67
NuBus 35, 40, 65
  power requirements 90
numeric keypad. *See* keyboard

O

open architecture 65
operating system. *See* Macintosh Operating System
operating temperature 87

P

packing lists 2
packing materials 3
paged memory management 39
paged memory management unit (PMMU) 39, 82–84
palette, defined 42
parallel communication 67. *See also* SCSI port
patch code 53, 57
peripheral cables 95–96
picture elements. *See* pixels
pin assignments 93–95
pixels 40–41
PMMU (paged memory management unit) 39, 82–84
ports 3, 64–67
  Apple Desktop Bus 4, 19–20, 64, 93
  modem 4, 64, 66, 93
  printer 4, 64, 66, 93
  SCSI 4, 56, 67, 83, 84, 94
  serial 66
power cord
  connecting 6–7
  main unit 2
  monitor 2, 16–17
power input unit
  main 4, 7
  monitor 16
Power On key 4, 18, 23, 26–28
power output unit (monitor) 4, 16
power requirements
  Apple Desktop Bus 89–90
  NuBus 90
power strip 8
power supply case, touching 9–10
power switch 4, 8
printer port 4, 64, 66
  pin assignments 93
printer resources. *See* resources
printers. *See* ImageWriter; LaserWriter
problems starting up 27
processors. *See* coprocessors; microprocessors; *or specific microprocessor*
product registration card 2
product serial numbers 3
programmer's switch 2, 88–89

Q

question mark icon 24, 26
quick reference card 2
quitting applications 60

R

RAM (random-access memory) 38–39, 53, 54, 57–59, 91. *See also* memory configurations 91–93
random-access memory. *See* RAM
read-only memory. *See* ROM
read/write heads 42, 43, 45
registers 34

registration card 2
reinitializing disks 45
relative humidity 87
removing disks 45
reset switch. *See* programmer's switch
resources 52–56
revising documents 59–60
RGB, defined 40–42
ROM (read-only memory) 39–40, 52–53, 57, 92. *See also* memory routines 40, 57
RS-232 devices, SCSI port and 98

**S**

safety instructions 22–23
saving documents 59–60
scanning order 56
scientific notation 35
screen. *See* monitor; video displays
screen buffer 41, 58
scroll arrows 58
scroll bars 58
SCSI cables 98–101
SCSI devices, connecting 21, 97–101
SCSI ID numbers, setting 101–102
SCSI port 4, 56, 57, 82–84
  pin assignments 94
  RS-232 devices and 98
SCSI terminators 98–101
sectors 44, 57, 59
security screw 8
serial communication 66. *See also* modem port; printer port
serial numbers 3
serial ports 66. *See also* modem port; printer port
service 78–79
setting up the system 6–21
Shut Down command (Special menu) 4, 7
SIMMs (Single In-line Memory Modules) 39
  configurations 91–93
  sockets 91–92
Single In-line Memory Modules. *See* SIMMs
size specifications 88
slots. *See* expansion slots
Small Computer System Interface. *See* SCSI port
software. *See* applications; system software
sound 82–84
sound generator, specifications 87
Special menu, Shut Down command 4, 7
specifications 86–88
starting up 23–24, 57–58
  applications 58
  problems with 27
  training disk 25–27
startup disks 56–57
  current 56
  scanning order and 56
stepper motor 42
stopping training disk 27–28
storage temperature 87
support 78–79
surge protector 8
System file 53, 57
System Folder 52, 55–56
system messages 53, 57
system software 52–56
  updating 28

**T**

technical documentation, guide to 103–106
technical information 85–102
temperature 87
terminators. *See* SCSI terminators
32-bit mode 34
3.5-inch disk drives 25, 42–43, 56
3.5-inch disks 42
  care of 76–77
  locking 46
tracks 44
training disk 24–28
  starting up 27
  stopping 27–28
tutorial 24–25
24-bit mode 34

**U**

unlocking disks. *See* locking disks
unpacking 2–3
updating disks 28
user groups xiv
User Interface Toolbox 40

**V**

ventilation 20, 72
video cable 2
  connecting 15–16
video card 2, 41, 65
  installing 8–14
Video Card Expansion Kit 41
video displays 40–42, 82–84. *See also* monitor
viewing angle (monitor) 5

**W, X**

warranty card 2
weight specifications 88
wide-area networks 66–67
work area, arranging 5–6, 20–21
work surface height 5–6

**Y, Z**

*Your Apple Tour of the Macintosh IIx* disk 24–28. *See also* training disk